Economic Trends

March 2015 (March 1 – April 2, 2015)

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FEDERAL RESERVE BANK
of CLEVELAND

Household Debt and Post-Recession Auto Lending

03.06.2015
by O. Emre Ergungor and Caitlin Treanor

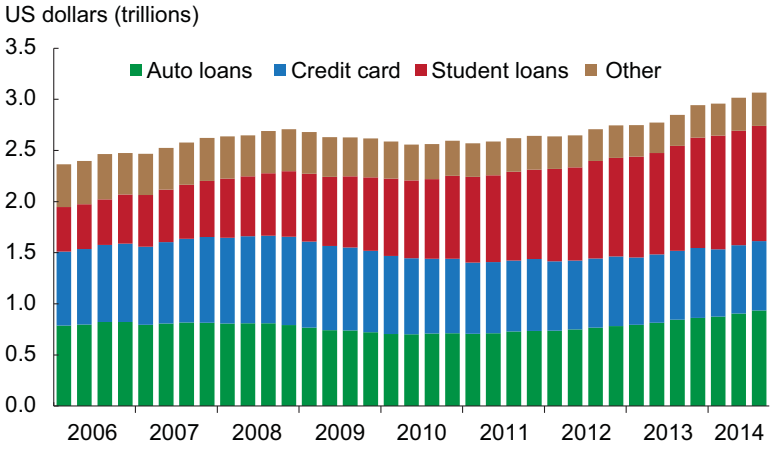
Household balance sheets have garnered significant attention since the 2008 financial crisis, with consumer debt being viewed as a contributor to the recession and household deleveraging emerging as a prominent feature of the recovery. In the third quarter of 2008, growth in loan balances began to flatten out and then decline. While this trend can be viewed as an improvement in fiscal responsibility, it has also been a drag on consumer spending and the recovery process. In recent quarters, total debt has started to edge back up.

The question now is whether the decline in borrowing has hit an end, signaling a return of consumer confidence. Data from the New York Fed's Credit Panel suggest that the answer may be yes. Home mortgage debt and credit card debt have stopped contracting. Student loans never really shrank. And auto loan balances (which include leases) have been rising for more than three years. Newly originated auto loans hit $105 billion in the third quarter of 2014, the highest they have been since the third quarter of 2005.

Why are auto loans in particular increasing so rapidly? The increase could be the result of borrowers suddenly wanting to purchase more cars, or it could be that lenders are more willing to provide credit, or it could be some combination of both. Parsing out the precise story—how much of the increase is due to an increase in the demand for cars or an increase in the supply of credit finally meeting more of the existing auto demand—is difficult.

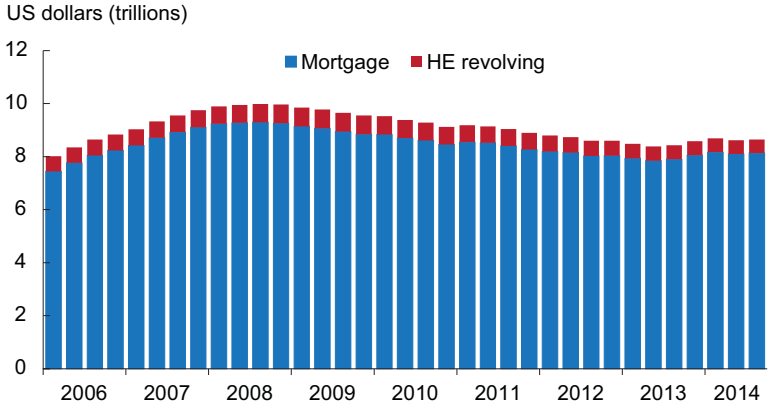
One way to examine the issue is to look at which individuals are receiving auto loans. Breaking down auto loan data by Equifax Risk Score, we can see that new loans are not just going to low-risk borrowers. Individuals with both good and bad Equifax Risk Scores are being extended more credit. Banks are extending more credit largely to those with a higher credit rating, while finance companies are extending more credit to individuals of all risk-levels, including those with subprime credit ratings

Total Household Non-Mortgage Debt Balance and Composition



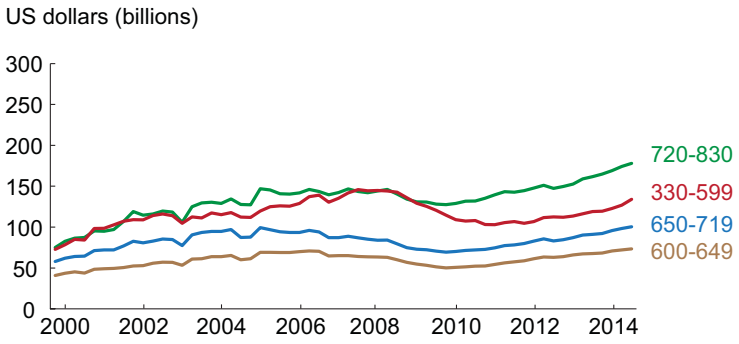
Sources: Federal Reserve Bank of New York's Consumer Credit Panel/Equifax; Haver Analytics.

Total Household Real Estate Debt Balance and Composition



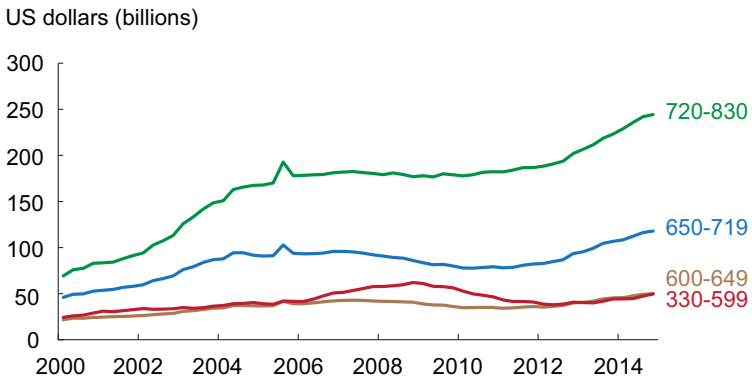
Sources: Federal Reserve Bank of New York's Consumer Credit Panel/Equifax; Haver Analytics.

Total Balance of Auto Loans from Finance Companies by Equifax Risk Score



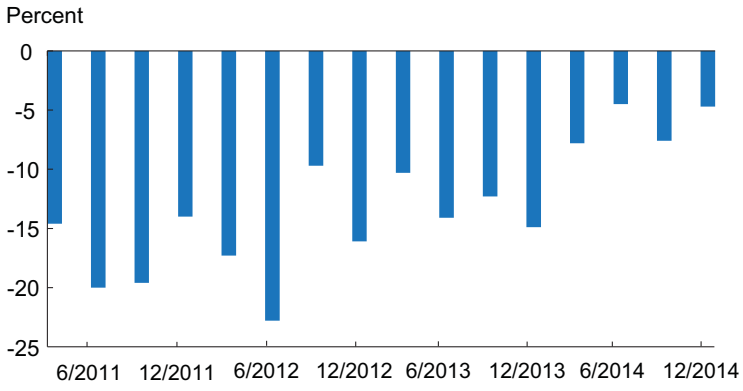
Source: Federal Reserve Bank of New York's Consumer Credit Panel/Equifax; Haver Analytics.

Total Balance of Auto Loans from Banks by Equifax Risk Score



Source: Federal Reserve Bank of New York's Consumer Credit Panel/Equifax; Haver Analytics.

Net Percentage of Domestic Respondents Tightening Standards on New and Used Auto Loans



Note: Negative numbers indicate net percentage easing.
Source: Board of Governors of the Federal Reserve System's Senior Loan Officer Opinion Survey on Bank Lending Practices.

(650 and below). Finance companies supply more than twice as much credit to this group as banks.

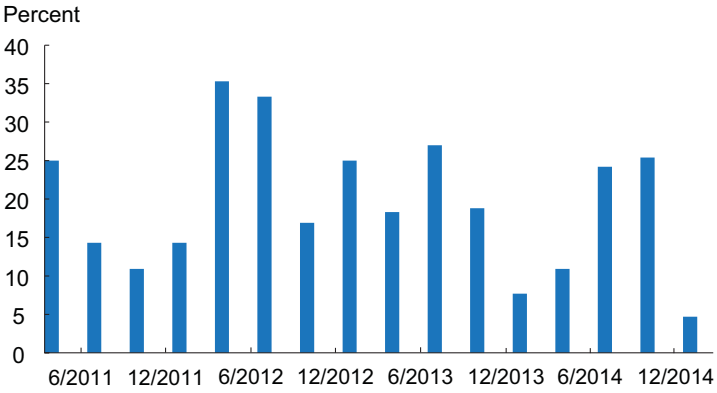
Given that a chunk of the increase in auto loans is being dealt out to the highest-risk borrowers, this could be an indication of declining risk-aversion among lenders and an increased supply of credit. On the other hand, that people with the best credit ratings, who likely had uninterrupted access to credit even after the downturn, are also seeking out (and receiving) more auto loans suggests that the increase in lending could be an indication of increased demand for cars.

To further understand recent household borrowing trends, we can look at data from surveys of lenders and consumers. The Senior Loan Officer Opinion Survey on Bank Lending Practices, published by the Federal Reserve Board, is a survey of up to 80 large domestic banks and 24 US branches or agencies of foreign banks, which asks questions about changes in the standards and terms of, as well as demand for, the banks' loans. Since April of 2011, results from this survey indicate a consistent easing of standards on auto loans. This is further evidence that the willingness to take on more risk has increased.

In the Survey of Consumer Expectations, released every month by the Federal Reserve Bank of New York, individuals are asked if they think it is generally easier or harder to obtain credit today, compared to 12 months ago. Since mid-2013, more consumers have found it easier to obtain credit (not auto credit specifically). The percentage of respondents reporting that it has gotten harder has gone down (from 49 percent in January 2014 to 39 percent in January 2015), while the percentage of respondents finding it easier has increased (from 14 percent in January 2014 to 24 percent in January 2015).

However, attractive financing options are likely not the only driver of the trend in auto loans, and an increase in demand for new vehicles could also be moving the market. The stock of cars on US roads is aging. According to the automotive market research firm Polk, the average age of US-registered vehicles was 9.6 years in 2002. This shot up to 11.2 years by 2012. If the difficult labor market environ-

Net Percentage of Domestic Respondents Reporting Stronger Demand for Auto Loans



Source: Board of Governors of the Federal Reserve System's Senior Loan Officer Opinion Survey on Bank Lending Practices.

ment and the tight credit standards of the past have discouraged the purchase of new vehicles, those effects are finally abating. Pent-up demand among auto consumers for new cars may now be showing up in the auto-loan data.

Increased demand is possibly the result of aging cars on the road. According to the automotive market research firm Polk, the average age of US-registered vehicles was 9.6 years in 2002. This shot up to 11.2 years by 2012. Pent-up demand among auto consumers for new cars may now be showing up in the auto-loan data.

There are two noteworthy trends in auto loans that have been laid out here. One, the state of the auto loan market has quickly rebounded post crisis. And two, there has been continued growth in auto loans across the board, including high-risk loans. There are some indications of increasing demand for auto loans as well as greater willingness to lend to riskier borrowers. One can only hope that lenders learned a valuable lesson from their past subprime lending experience.

Racial and Ethnic Differences in College Major Choice

03.31.2015
by Peter Hinrichs

There are large differences in the average earnings of people who choose different college majors. Majors in computer science, mathematics, and in a variety of engineering fields are associated with high earnings, while majors such as counseling psychology, early childhood education, and social work are associated with low earnings. A recent report finds the median annual earnings for full-time, full-year workers with a terminal bachelor's degree in petroleum engineering are $120,000, whereas the comparable figure for those who had majored in counseling psychology is only $29,000 (What's It Worth? The Economic Value of College Majors).

It is not clear to what extent these earnings disparities reflect a true causal effect of college major on earnings and to what extent they reflect differences in the characteristics of students who choose to major in different subjects. But it seems safe to say that the choice of a college major has at least some effect on economic outcomes for students. And if college majors affect outcomes for individuals, they may also affect differences in outcomes across demographic groups, such as the lower incomes of blacks and Hispanics relative to whites and Asians. If this is the case, then studying differences in college major choice across groups may help in understanding economic disparities between groups. Much attention has been paid, for example, to gender differences in the propensity to major in STEM (science, technology, engineering, and mathematics) subjects. Here I consider differences in college major choice by race and ethnicity.

The data come from the Integrated Postsecondary Education Data System (IPEDS), a survey conducted by the National Center for Education Statistics in the US Department of Education. Completing the IPEDS survey is required of all colleges and universities that participate in federal financial aid programs. The survey can thus roughly be thought of as a census of institutions of higher education. I use information on the number of bachelor's de-

Most Popular Majors by Race and Ethnicity

Asian

Major	Percent
Business Administration	8.2
Biology	8.2
Nursing	5.7
Psychology	5.5
Accounting	3.8
Economics	3.7
Finance	2.6
Political Science	2.1
Sociology	1.7
Electrical Engineering	1.7

Black

Major	Percent
Business Administration	10.3
Psychology	7.2
Nursing	5.8
Criminal Justice/ Safety Studies	3.5
Biology	3.3
Sociology	3.2
Social Work	2.3
Accounting	2.3
Political Science	2.2
Criminal Justice/Law Enforcement Administration	2.0

Hispanic

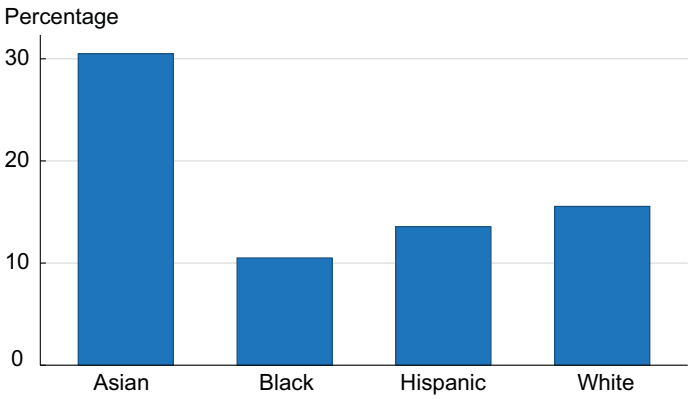
Major	Percent
Business Administration	7.7
Psychology	7.6
Nursing	4.9
Biology	3.5
Sociology	2.9
Criminal Justice/ Safety Studies	2.8
Accounting	2.7
Political Science	2.6
English	2.2
Multi-/Interdisciplinary Studies	2.0

White

Major	Percent
Business Administration	6.5
Psychology	6.0
Nursing	5.9
Biology	3.5
Accounting	2.8
English	2.8
Elementary Education	2.6
History	2.4
Political Science	2.3
Marketing	2.0

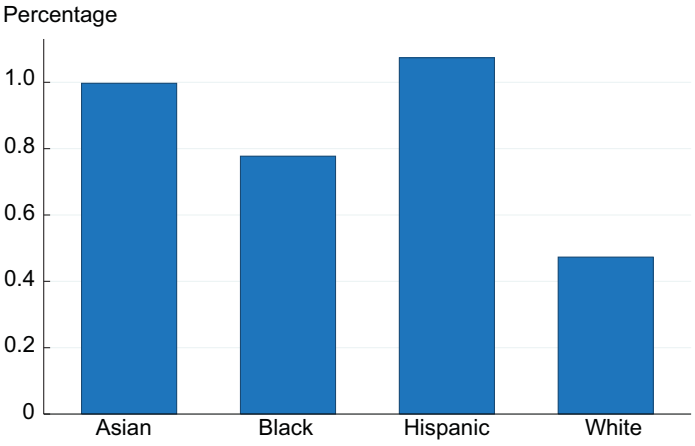
Source: Author's calculations from Integrated Postsecondary Education Data System (IPEDS) data for July 1, 2012 – June 30, 2013.

Percentage of Bachelor's Degree Recipients Majoring in STEM Subjects



Source: Author's calculations from Integrated Postsecondary Education Data System (IPEDS) data for July 1, 2012 − June 30, 2013. The majors included are those with a two−digit Classification of Instructional Programs (CIP) code in the following categories: computer and information sciences and support services, engineering, biological and biomedical sciences, mathematics and statistics, and physical sciences.

Percentage of Bachelor's Degree Recipients Majoring in Area, Ethnic, Cultural, Gender, and Group Studies Subjects



Source: Author's calculations from Integrated Postsecondary Education Data System (IPEDS) data for July 1, 2012 − June 30, 2013.

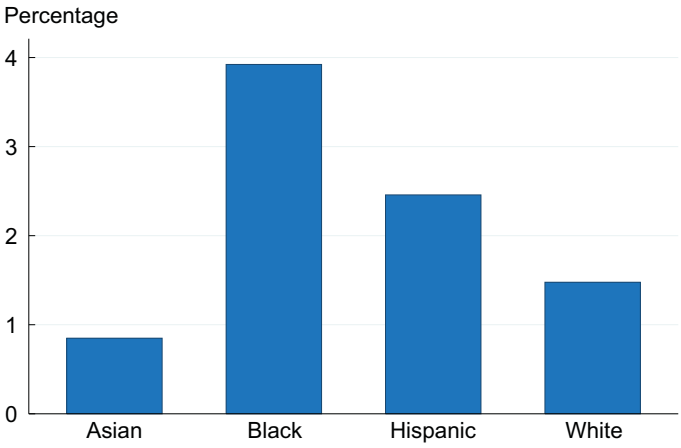
grees received by members of four mutually exclusive groups, Asians, blacks, Hispanics, and whites, in different majors between July 1, 2012, and June 30, 2013. IPEDS categorizes majors using six-digit codes from the Classification of Instructional Programs (CIP), which standardizes majors across institutions but still allows for fine detail on majors.

Looking at the most popular majors by racial and ethnic group, one feature that is apparent is the great deal of similarity across groups. For example, business administration, psychology, nursing, and biology are four of the top five majors for all four of the groups shown. There are some differences, however. For example, economics, finance, and electrical engineering appear on the top-ten list only for Asian students, whereas social work appears on the list only for black students. Elementary education, history, and marketing are unique to the top-ten list for white students.

To explore differences in major choice by race and ethnicity across broader groups of majors, I aggregate majors up to the two-digit CIP level. I begin by examining differences in STEM subjects. I use a narrow definition of "STEM fields," which includes only fields with a two-digit major code in the following categories: computer and information sciences and support services, engineering, biological and biomedical sciences, mathematics and statistics, and physical sciences. Using this definition, about 16 percent of white bachelor's degree recipients had a major in a STEM subject, and over 30 percent of Asian students did. The comparable figures for black and Hispanic students are around 11 percent and 14 percent, respectively.

If STEM fields have a disparity in favor of Asian and white students, which fields have a disparity in favor of black and Hispanic students? One set of fields with particularly low representation from white students consists of those included in the two-digit CIP major category "area, ethnic, cultural, gender, and group studies." However, relatively few students from any racial or ethnic group major in these subjects. Less than 1 percent of black students major in these subjects, about 1 percent of Asian students do, and only slightly more than 1 percent of Hispanic students do.

Percentage of Bachelor's Degree Recipients Majoring in Public Administration and Social Service Professions Subjects



Source: Author's calculations from Integrated Postsecondary Education Data System (IPEDS) data for July 1, 2012 − June 30, 2013.

An area in which there is an even larger disparity in favor of black and Hispanic students is the two-digit CIP major category for public administration and social service professions. Nearly 4 percent of black students and 2.5 percent of Hispanic students major in these subjects, whereas only around 1.5 percent of white students do and less than 1 percent of Asian students do.

So although there are a number of similarities in major choice across racial and ethnic groups, there are also some differences. And there are inherent tradeoffs for policies and programs designed to draw students into selected majors. New students in these majors must come from somewhere. The possibilities are students who would not have otherwise attended college, students who would add the selected major as an additional major, and students who would major in the selected subject instead of some other subject. For example, having more STEM majors may come partly at the expense of fewer social work majors. Whether this shift would enhance students' overall well-being or be best for society as a whole is a difficult question.

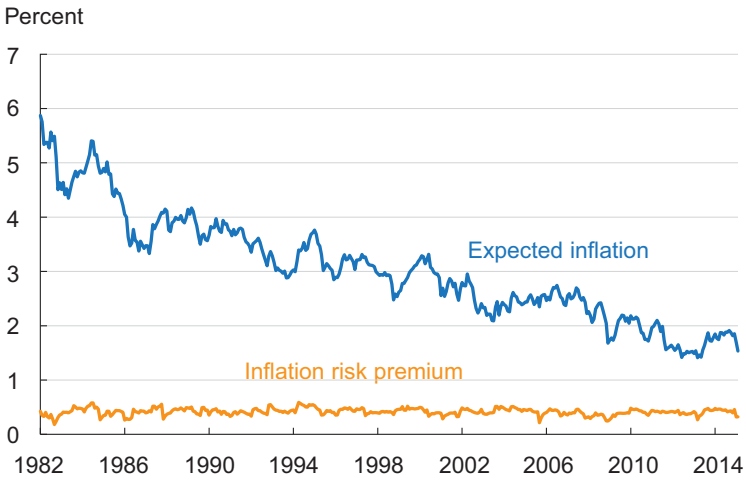
Cleveland Fed Estimates of Inflation Expectations, March 2015

News Release: March 24, 2015

The latest estimate of 10-year expected inflation is 1.70 percent, according to the Federal Reserve Bank of Cleveland. In other words, the public currently expects the inflation rate to be less than 2 percent on average over the next decade.

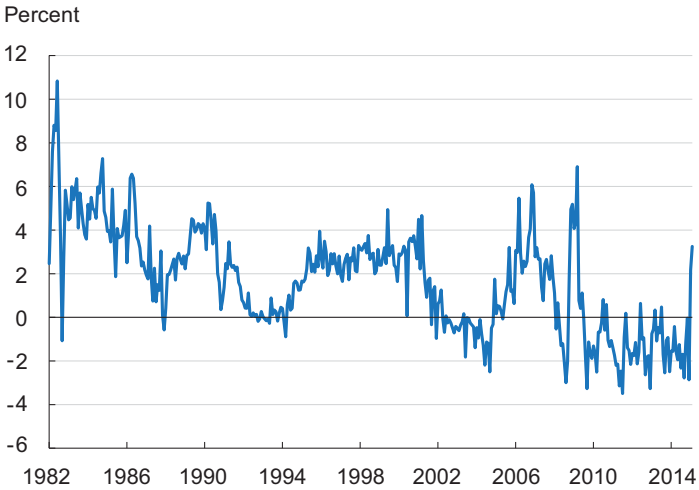
The Cleveland Fed's estimate of inflation expectations is based on a model that combines information from a number of sources to address the shortcomings of other, commonly used measures, such as the "break-even" rate derived from Treasury inflation protected securities (TIPS) or survey-based estimates. The Cleveland Fed model can produce estimates for many time horizons, and it isolates not only inflation expectations, but several other interesting variables, such as the real interest rate and the inflation risk premium.

Ten-Year Expected Inflation and Real and Nominal Risk Premia

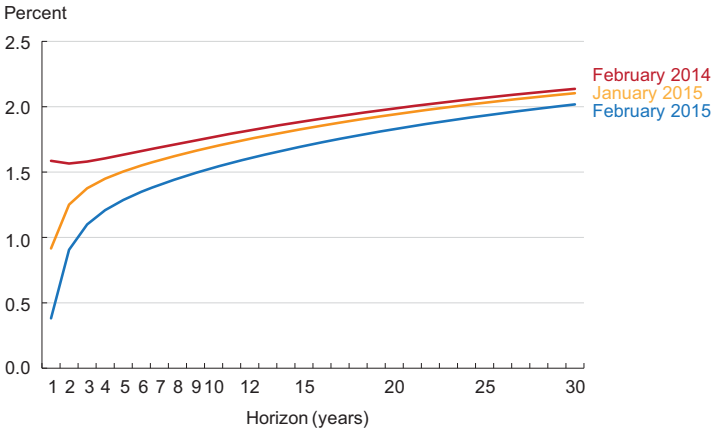


Source: Haubrich, Pennacchi, Ritchken (2012).

Real Interest Rate



Expected Inflation Yield Curve



Source: Haubrich, Pennacchi, Ritchken (2012).

Do Energy Prices Drive the Long-Term Inflation Expectations of Households?

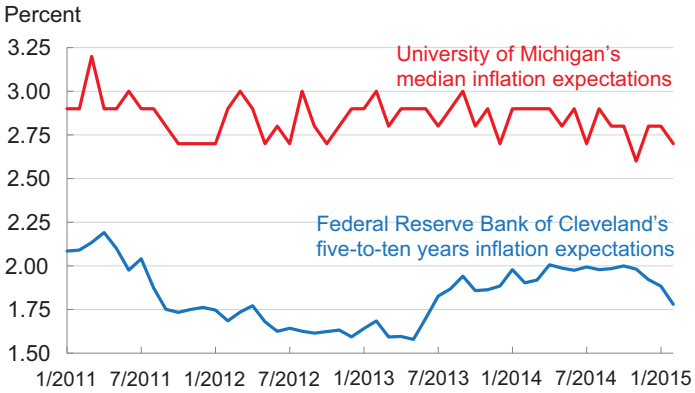
03.24.2015
by Randal Verbrugge and Amy Higgins

Between July 2014 and January 2015, the average price of gasoline fell by more than 33 percent. This decline in gas prices has significantly impacted the Consumer Price Index (CPI), which has actually fallen every month since October 2014. Both the dramatic fall in gasoline prices and the recurrent drops in the CPI raise the question of how these developments are affecting the long-term inflation expectations of households. This is a question worth pursuing, because anchored long-term inflation expectations are important for promoting short-run inflation stability and for facilitating central bank efforts to achieve output stability.

Over the past several months, two noted measures of long-term inflation expectations have slipped somewhat: the expectations of households from the Thomson Reuters/University of Michigan Surveys of Consumers (UM Survey) and the expectations estimated by the Federal Reserve Bank of Cleveland (FRBC) based upon financial market data and professional forecasts. Are these expectations anchored or are they driven by energy-price changes? Some prominent analysts have argued that household inflation expectations respond strongly to changes in energy prices. But previous analysis has focused mainly on shorter-term inflation expectations. We examine the role played by energy prices in influencing long-term inflation expectations relative to the impact of movements in the CPI and other macroeconomic variables.

Household inflation expectations are measured in a national survey. Each month, the Survey Research Center at the University of Michigan surveys about 500 households and asks them questions about economic conditions. One survey question asks consumers about their inflation expectations five to ten years ahead. ("By about what percent per year do you expect prices to go (up/down) on average, during the next 5 to 10 years?") We study the median response.

Long-Term Inflation Expectations



Sources: University of Michigan's Survey of Consumers; Federal Reserve Bank of Cleveland.

Each month, the Federal Reserve Bank of Cleveland estimates inflation expectations at various horizons. These estimates are based upon inflation swap data in conjunction with nominal Treasury yields and survey information from professional forecasters. Using the published five-year and ten-year inflation expectations estimates, one can construct inflation expectations that match the implied horizon of the UM Survey.

We examine the potential influence of seven different variables on long-term inflation expectations. Examining the role of these seven variables simultaneously allows us to properly determine the role played by energy-price inflation. To conduct the analysis, we use a particular type of statistical model that is used to inform forecasting and policy analysis at the Cleveland Fed, a structural Bayesian vector autoregression (SBVAR). This is a statistical model which simultaneously measures the cross-correlations between many different variables—including their cross-correlations across time—and entails assumptions about contemporaneous influences between variables. (For details, see Binder, Higgins and Verbrugge, forthcoming.) In our analysis, we assume that energy prices are not contemporaneously influenced by any other variable within the current month. This is the conventional assumption.

Four of the seven variables are elements of the CPI: energy prices, food prices, shelter prices, and the overall CPI. To measure overall CPI trends, we use smoothed monthly changes in the median CPI, which performs well as a predictor of future CPI trends and is far superior to the so-called "core CPI" in this regard. We measure energy-price movements, food-price movements, and shelter-price movements relative to the overall CPI movement.

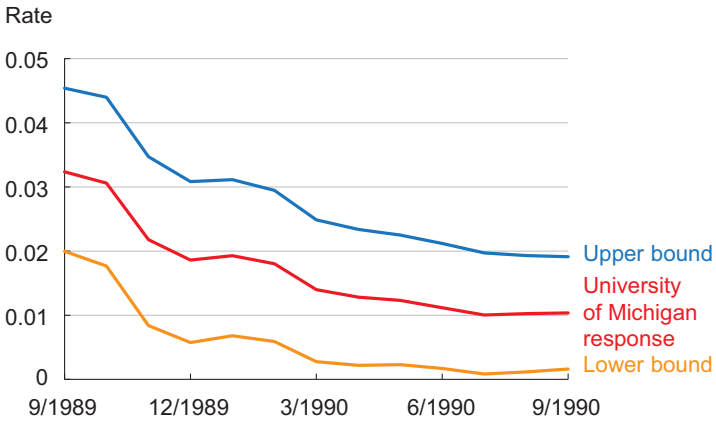
The remaining three variables are macroeconomic variables. We include these because inflation expectations may respond to economic activity and to monetary policy. The macroeconomic variables are: the Chicago Fed National Activity Index (CFNAI), which measures economic activity changes on a monthly basis; the unemployment rate; and the federal funds rate. The inflation expectations variable is either the UM Survey or the FRBC measure.

We relate movements in inflation expectations (measured in percent) to movements in each of these variables (measured in percent). Our analysis is based upon monthly changes. We estimate from mid-1990 through the first month of 2015; UM Survey data on long-term expectations are not available on a monthly basis prior to mid-1990.

The figure at left plots the response of UM Survey expectations to a typically sized shock to energy prices. The impulse response is plotted for 12 months after the shock, along with error bands. If zero does not lie in between the error bands at a particular month, then—on a statistical basis—there is reliable evidence that the impact is distinguishable from zero. We see that energy-price shocks do indeed have a noticeable and statistically significant influence on UM Survey expectations for at least 12 months. However, the response is quite small. A typically sized positive energy-price shock raises UM Survey inflation expectations by just over 0.03 percentage points the month it happens; thus, for example, if UM Survey inflation expectations had been 3.0 percent without the shock, this shock would raise long-term inflation expectations to 3.03 percent. But 12 months later, the effect of the shock is only 0.01 percentage points. We do not depict any of the other impulse responses, as there is very little evidence for an influence of any of the other six variables—including movements in the median CPI.

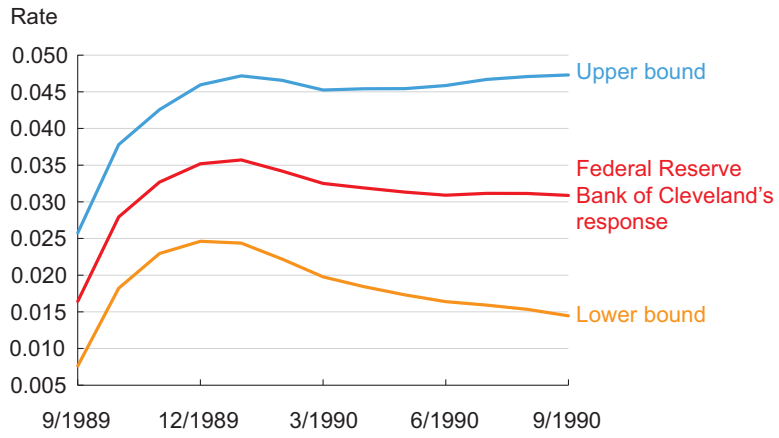
The following figures plot the response of FRBC inflation expectations to a typically sized shock to energy prices and to the CFNAI. As with UM Survey expectations, the impacts are statistically significant, but economically small. Energy-price shocks impact FRBC inflation expectations, with the estimated effect rising to a little above 0.03 percentage points two months after the shock and then falling to slightly below 0.02. The effect of an energy-price shock is, however, indistinguishable from zero after seven months. Conversely, shocks to CFNAI have a persistent impact on FRBC inflation expectations. A typically sized CFNAI shock raises FRBC inflation expectations by roughly 0.03 percentage points, an effect that persists for a year. None of the other variables has an appreciable impact on FRBC inflation expectations.

University of Michigan's Impulse Response Function to Energy Inflation



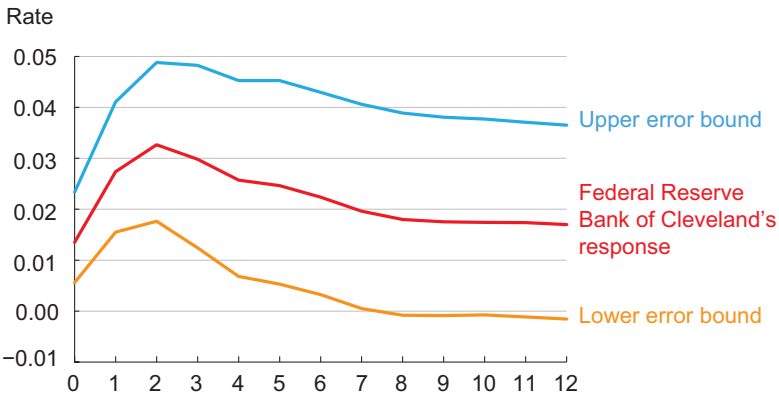
Source: University of Michigan's Survey of Consumers.

Federal Reserve Bank of Cleveland's Impulse Response Function to CFNAI



Source: Federal Reserve Bank of Cleveland.

Federal Reserve Bank of Cleveland's Impulse Response Function to Energy Inflation



Source: Federal Reserve Bank of Cleveland.

The impulse responses relate to typically-sized shocks, but the most recent six-month movement in energy-price inflation is far from typically sized. Suppose we do a simple exercise and assume that the entire drop in energy prices actually happened over the period of one month. This amounts to a shock that is about eight times bigger than is typical. A back-of-the-envelope calculation says that such a shock, all by itself, would lower UM Survey inflation expectations the next month by about 0.24 percentage points and would lower FRBC inflation expectations by about 0.22 percentage points. Since June 2014, both measures of expectations have dropped by about 0.2 percentage points. Hence, recent drops in energy prices can potentially explain the recent slippage in both of the inflation expectations measures we examine. Further, this suggests that a rebound of energy prices would lead to a similar rebound in long-term inflation expectations.

We next go on to look at variance decompositions, which measure how much of the variation in inflation expectations ultimately derives from shocks to another given variable over various time horizons. We focus on the impact of energy-price shocks as compared to "other macro variables" (the combined effects of the three macroeconomic variables—the CFNAI, the unemployment rate, and the federal funds rate), "other price variables" (the combined effect of shocks to food inflation, shelter inflation, and overall CPI inflation), and "unexplained" (the effect of shocks to expectations themselves). We first look at the variance decomposition for UM Survey inflation expectations.

While energy-price shocks clearly matter, over the 1990-2014 period they generally account for less than 10 percent of the variance of UM Survey inflation expectations, despite being the single biggest explanatory factor. While long-term household inflation expectations do respond to incoming data, this response is muted. Even at the 12-month horizon, the vast majority of the variance is unexplained by other variables.

Next we consider the variance decomposition for FRBC inflation expectations.

Impact of Shocks on University of Michigan's Inflation Expectations

Area	Impact of Shock (percent)			
	Energy Prices	Macro Variables	Price Variables	Unexplained
Immediately	3	0	2	95
Three months later	7	0	3	90
Six months later	8	0	3	89
12 months later	8	1	4	87

Impact of Shocks on Federal Reserve Bank of Cleveland's Inflation Expectations

Area	Impact of Shock (percent)			
	Energy Prices	Macro Variables	Price Variables	Unexplained
Immediately	1	2	0	97
Three months later	5	5	1	89
Six months later	5	7	1	87
12 months later	5	9	1	85

For FRBC inflation expectations, energy-price shocks are usually even less important, accounting for 5 percent of the variance at most. In fact, they are generally less important than shocks to macroeconomic variables, chiefly CFNAI shocks. At all horizons, the vast majority of the variance of FRBC inflation expectations is unexplained by other variables.

Such results suggest that both UM Survey and FRBC inflation expectations are well-anchored, in the sense that they are "relatively insensitive to incoming data," as former FOMC chair Ben Bernanke defined "anchored." Of course, very dramatic movements in energy prices will still shift inflation expectations to some extent, as we noted above.

What drives inflation expectations? While energy prices have a greater influence on the long-term inflation expectations of households (UM survey) than on the FRBC measure of inflation expectations, their quantitative influence is generally quite modest. Shocks to energy prices explain very little of the usual variation in either UM Survey inflation expectations or FRBC inflation expectations. But the recent drops in energy price inflation are far from usual, and we show that these unusual energy-price movements can potentially explain the recent drops in both inflation expectations measures.

While both UM Survey inflation expectations and FRBC inflation expectations appear to be well-anchored, in the sense that they are relatively insensitive to incoming data, these expectations are not identical. Household long-term inflation expectations are much higher. Also, these expectations are differently influenced by shocks; for instance, while macroeconomic shocks impact FRBC inflation expectations, they do not appear to impact UM Survey inflation expectations. What accounts for such differences in expectation formation? These are questions left for future work, but we briefly mention two conjectures.

One potential explanation is that a feature of the UM Survey might be unduly influencing the estimated expectations. When asked about their inflation expectations, households are required to give an integer response. We do not view this restriction as innocuous. Previous research indicates that this

kind of rounding can influence actual aggregate estimates and outcomes (see, e.g., Schweitzer and Severance-Lossin (1996) and Knotek (2011).) However, recent evidence from the New York Fed's Survey of Consumer Expectations suggests that when consumers are asked about inflation, they often give integer responses, even if they need not do so.

Another possibility is suggested by the recent research of Carola Binder. She reviews a large number of surveys given to consumers from the 1950s until the present and finds that consumers are often confused about the link between monetary policy and inflation and that many fear the return of the high inflation experience of the 1970s. In studying the UM Survey data, she also finds that households differ in their uncertainty about future inflation—likely due to differences in financial literacy—and that the expectations of the more certain households are more accurate (Binder 2014a). It is possible that the expectations of more certain or more informed households are closer to those estimated by the Federal Reserve Bank of Cleveland.

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Survey- and Market-Based Inflation Expectations

03.31.2015
by Mehmet Pasaogullari and Sara Millington

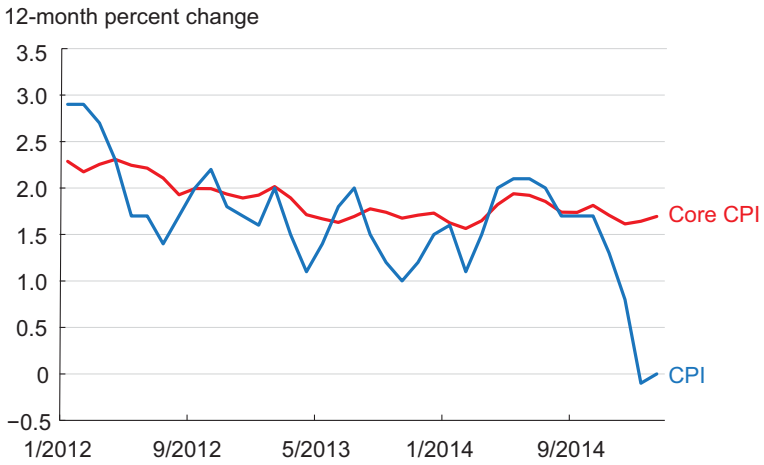
With the latest CPI release, some indicators of inflation are still at very low levels. The monthly CPI inflation rate rose to 0.2 percent in February after being negative for the previous three months, while the year-over-year CPI inflation rate was 0.0 percent. On the other hand, the core CPI, which excludes volatile energy and food prices, was 1.7 percent year-over-year, a slight increase over its level of 1.6 percent in the previous two months. Still, annual core CPI inflation is about 0.2 percent lower than its level in June 2014. Since expectations are an important factor affecting future inflation and one of the variables attended to closely by the FOMC, this piece looks at recent trends in various measures of inflation expectations.

First we look at three measures of short-term inflation expectations—the median expectation from the monthly University of Michigan Survey of Consumers (UM Survey) and the median CPI and core CPI expectations from the quarterly Philadelphia Fed Survey of Professional Forecasters (SPF).

The 1-year UM inflation expectation declined from 3.3 percent in July 2014 to 2.5 percent in January 2015, its lowest value since September 2010. The declining price of oil seems to be the main culprit here, as earlier episodes of volatile oil prices led to similar changes in this measure. The 1-year inflation expectation from this measure has rebounded since then, with a 3.0 percent reading in the March 2015 survey. The 1-year SPF expectation for core CPI inflation declined 0.3 percent in the last two surveys; it's now at 1.8 percent. The 1-year SPF expectation for CPI inflation has also declined during this time, with a 1.9 percent level in the last survey.

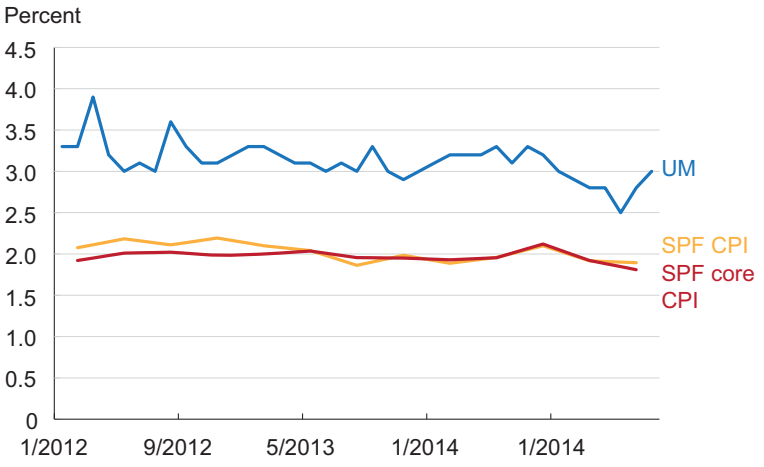
We now look at the probability measures for the core CPI from the SPF survey. Survey respondents assign probabilities for different ranges of the annual core CPI inflation rate in the fourth quarter of the current year and for the next year. Looking at these probabilities, we see a shift to the left in

CPI and Core CPI



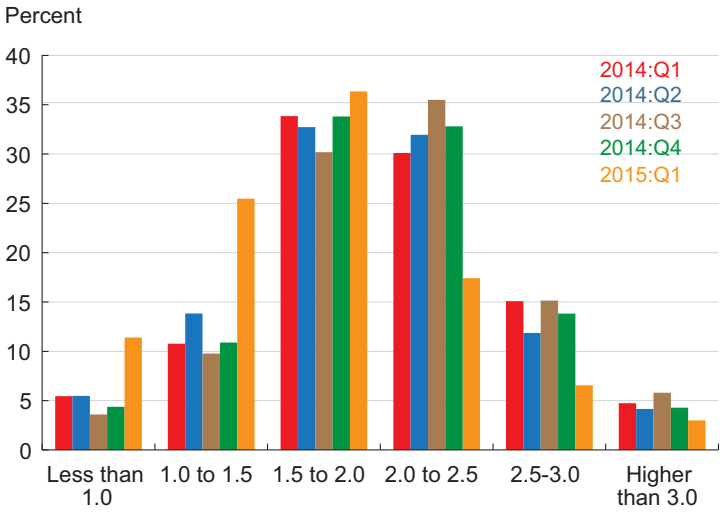
Source: Bureau of Labor Statistics.

One-Year Ahead Inflation Expectations



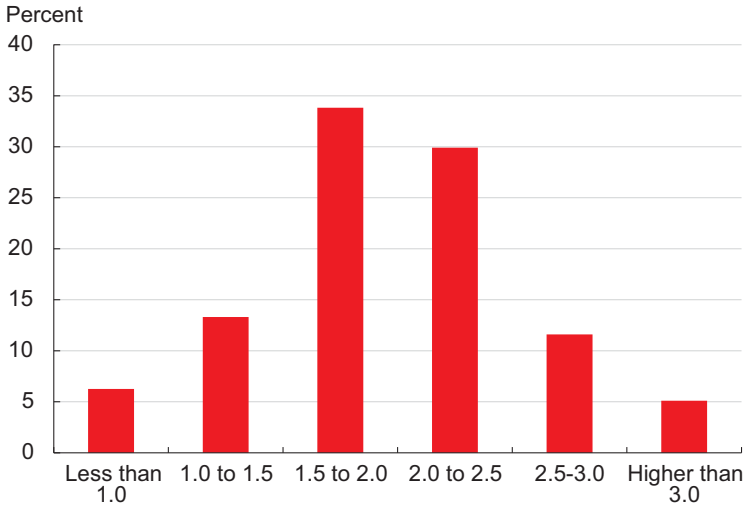
Sources: Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters; University of Michigan.

SPF Core CPI Probabilities, 2015:Q4



Source: Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters.

SPF Core CPI Probabilities, 2016:Q4



Source: Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters.

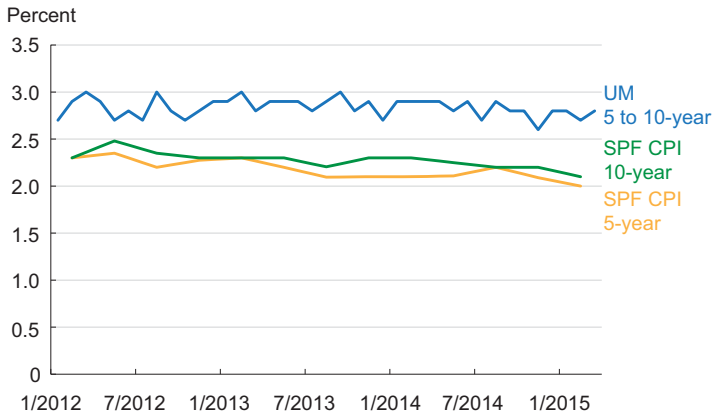
their distribution at the end of 2015 in the last two surveys. This shift means that the probabilities of the lower ranges increased while the probabilities of the higher ranges declined. Although the 1.5 to 2.0 percent range is still viewed as the most likely outcome at 36 percent, survey participants placed a 37 percent probability on the event that the core CPI will be lower than 1.5 percent at the end of 2015. However, survey participants assign less than a 20 percent probability to the event that the core CPI will be less than 1.5 percent at the end of 2016, with the 1.5 to 2.0 percent range again being the most likely outcome (with a 34 percent probability) and the 2.0 to 2.5 percent range being the second-most likely (with a 30 percent probability).

We conclude that these inflation measures are sending mixed signals. Still, while there have been some declines in the SPF CPI and core CPI short-term inflation expectations, there are no worrying signs of a rapid disinflation. In addition, the two recent UM surveys as well as the probabilities for the core CPI ranges for the next year suggest a relatively higher inflation outlook.

We now turn to long-term inflation expectations. The UM inflation expectation in 5 to 10 years has been hovering around the 2.7-2.8 percent range over the last four months and is at 2.8 percent in March 2015. On the other hand, the SPF expectation for CPI inflation in 5 years eased 0.2 percent in the last two surveys. It's at 2.0 percent in the 2015:Q1 survey, the lowest since 2010:Q4. The SPF 10-year CPI inflation expectation has been on a declining trend since 2014:Q1 and is at 2.1 percent in the 2015:Q1 survey, its lowest level on record since the SPF survey started to ask for this particular expectation in 1991:Q4. Although the SPF series have not shown significant jumps and the levels are not far from their recent averages, the figures still reveal a declining inflationary pressure in the long-term outlook.

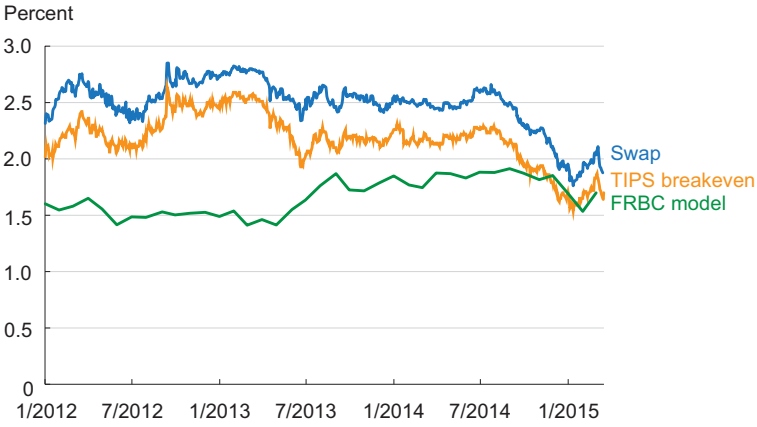
Finally, we look at a few market and model-based expectations of long-term inflation—the 10-year TIPS breakeven inflation rate, the 10-year inflation swap rate, and the 10-year inflation expectation from the Federal Reserve Bank of Cleveland model, which incorporates market and survey data and is

Long-Term Inflation Expectations



Sources: Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters; University of Michigan.

Ten-Year Expectations



Source: Federal Reserve Bank of Cleveland; Bloomberg.

able to separate the expectation from an inflation risk premium component, which is likely to contaminate the market-based measures.

Market measures of inflation expectations were on a declining trend between mid-summer 2014 and mid-January 2015. For example, the 10-year inflation swap rate fell by 0.90 percent between July 25, 2014, and January 13, 2015. Although these measures increased until early March, they started to recede again thereafter. As of March 16, the 10-year TIPS breakeven rate is 1.65 percent and the 10-year inflation swap rate is 1.88 percent. The FRBC 10-year inflation expectation measure declined by 0.4 percent between September 2014 and February 2015, to 1.5 percent. In March 2015 it picked up and now is at 1.7 percent.

To conclude, we have seen the recent data point to a decline in the SPF and market-based measures of long-term inflation expectations. In the case of the SPF, the declines were limited, although the 10-year inflation expectation was at its lowest value. In the case of the market-based measures, the declines have been partially reversed since January but still point to a relatively larger ease of long-run inflation pressures. The model-based measure picked up in March but still shows an expectation of only 1.7 percent for the average rate of inflation over the next 10 years.

Exchange-Rate Pass-Through and US Prices

03.24.2015

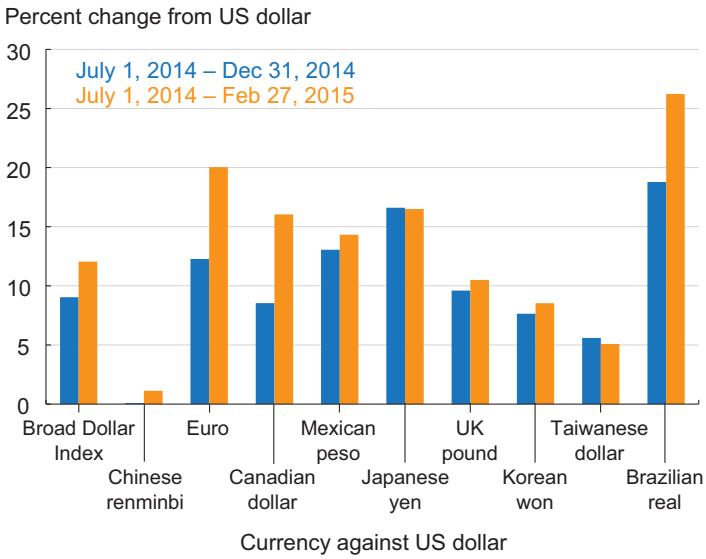
by Owen F. Humpage and Timothy Stehulak

The prospect that monetary policy in the United States will soon tighten while monetary policy in Europe, Japan, and many other countries eases has launched the dollar skyward in foreign-exchange markets. Some worry that the price impacts of the dollar's appreciation will push an already soft US inflation rate deeper into negative territory. The threat is real, but certainly overblown. Most of the change in import prices reflects declines in petroleum products, which have not been driven by exchange-rate movements. So we focus instead on nonpetroleum imports to show how the dollar's appreciation is passing through to import prices and on to the CPI.

Dollar appreciations can have both direct and secondary impacts on import prices; consequently their effects can linger. All else constant, an appreciation will quickly lower the dollar price of goods produced abroad and priced at their source in foreign currencies. In addition, the dollar appreciation will raise the foreign-currency price of US exports. Together, these direct price impacts will shift global demand—both US and foreign—away from goods and services produced in the United States and toward those produced abroad. This shift in demand can then induce secondary price effects, raising the foreign-currency price of US imports. These secondary effects—often based on the strategic decisions of foreign producers—can offset, or even negate, the direct price effects from a dollar appreciation. Our rough calculations, which are consistent with previous findings, suggest that, in general, a jump in dollar exchange rates can affect import prices for at least six months, but that the overall impact is fairly small. A 1 percent change in the Board of Governor's broad dollar exchange-rate index lowers non-petroleum import prices by 0.3 percent cumulatively over six months.

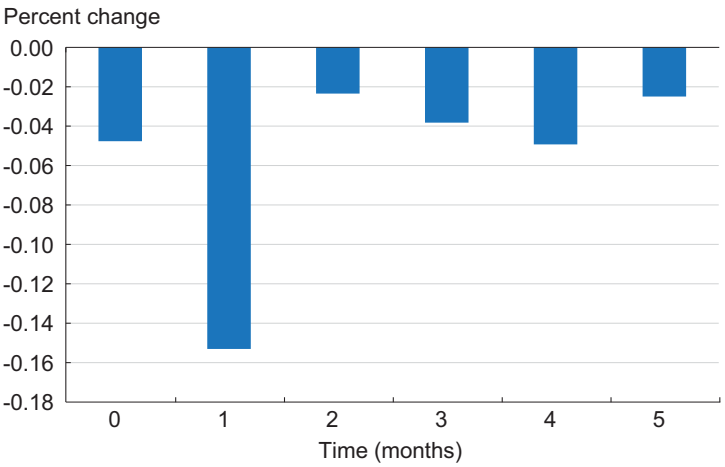
Exchange-rate movements have always had less of an effect on US import prices than on other countries' import prices because roughly 95 percent[1] of

Dollar Appreciation



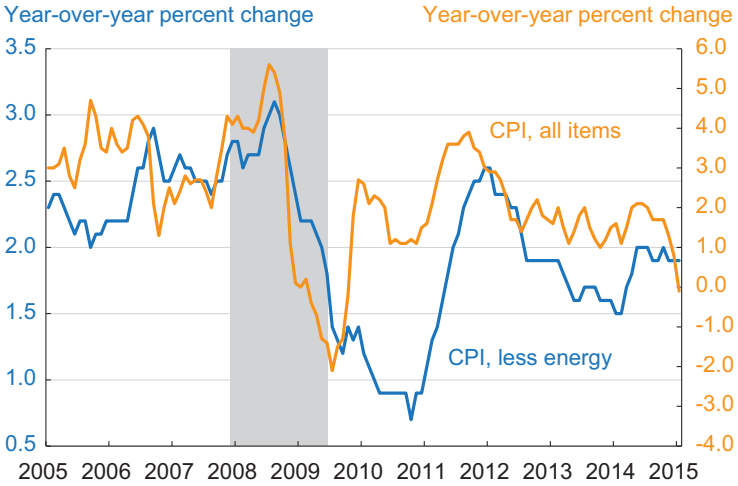
Source: authors' calculations based on data from Haver Analytics.

The Import-Price Response to Exchange-Rate Changes



Note: Bars measure the percentage point changes in the non-petroleum import-price index over the contemporaneous and five subsequent months to a one-percentage point change in the broad dollar index.
Sources: authors' estimations based on data from the Board of Governors of the Federal Reserve System and the Bureau of Labor Statistics.

Consumer Price Indexes



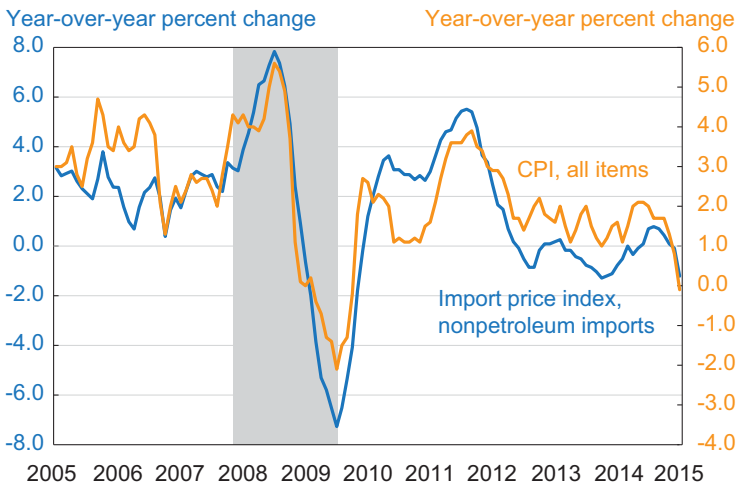
Note: Shaded bar indicates a recession.
Sources: Bureau of Labor Statistics/Haver Analytics.

the goods coming into the United States are priced in dollars, not in foreign currencies, making them impervious to the vicissitudes of exchange rates. International trade in standardized commodities, such as agricultural and petroleum products, and goods sold in highly competitive markets is typically denominated in dollars, even when that trade does not involve Americans. In contrast, international trade in diverse manufactured goods, where price competition is less rigorous, tends to be set in the exporters' currencies. How exchange-rate changes affect these goods depends on the producers' responses. As demand shifts from the United States to foreign-made products, foreign manufacturers may boost their prices, offsetting the exchange-rate effects to US consumers. How producers respond depends on many industry-specific factors, notably capacity utilization, but the larger and the more persistent the exchange-rate change, the more likely producers will respond.

Economists have noted that the pass-through of exchange-rate changes to import prices, both in the United States and in many other countries, has declined over the past 40 years. They attribute this trend in large part to a decline in global inflation, which has bolstered central-bank credibility and has lessened exchange-rate volatility. When the environment is more stable, firms resist quickly passing exchange-rate changes on to prices. In addition, China's rise as a major low-cost global competitor has made many firms wary about changing their prices. Increased facilities for hedging exchange-rate movements may also allow firms to delay—and possibly avoid—passing exchange-rate movements on to prices.

Still, large exchange-rate movements can induce price effects, as we are beginning to see. From its trough in early July through the end of December 2014—a date that facilitates comparisons with available import-price data—the dollar appreciated 9.0 percent on a broad trade-weighted basis. Over that same period, total import prices fell by 9.7 percent, but nonpetroleum import prices fell only 1.3 percent. Our rough estimates of the effects of exchange-rate changes on nonpetroleum import prices suggest that virtually the entire decline in these prices reflects the dollar's appreciation. (We

CPI and Nonpetroleum Import Price Index



Note: Shaded bar indicates a recession.
Sources: Bureau of Labor Statistics/Haver Analytics.

estimated a 1.6 percent change in nonpetroleum import prices, all else constant.) A further drop seems likely in February.

Estimating the impact of the dollar's appreciation on consumer prices—as passed through from import prices—is very difficult because it depends critically on what is causing the exchange rate to change in the first place. Higher inflation abroad, for example, might lead to an immediate dollar appreciation and—for a time—lower dollar import prices. The appreciation could have a temporary, broader effect on US consumer prices, but it would not cause deflation in the United States. That would require a tightening of US monetary policy. In the present situation, the dollar's appreciation seems largely the result of an anticipated tightening of US monetary policy relative to monetary policies abroad and that tightening itself may eventually affect US consumer prices. The appreciation in part seems a near-term conduit of that change, not so much an independent cause, because exchange rates typically react faster to expected monetary-policy changes than goods prices.

With that caveat in mind, we find a small impact on the CPI. Between July 2014 and January 2015, as nonpetroleum import prices fell 1.3 percent, the CPI fell 1.2 percent. The entire decline in the CPI stemmed from a substantial drop in petroleum products; the CPI less energy rose 0.6 percent. Our rough estimates suggest that absent the decline in nonpetroleum import prices, all of which we ascribed to the dollar's appreciation, the CPI less energy would have risen an additional 0.05 to 0.06 percentage point. The impact on the CPI would have been slightly less.

1. This percent is from the Bureau of Labor Statistics and pertains to the twelve months ending in September 2014. See also: "The Internationalization of the Dollar and Trade Balance Adjustment" at http://www.newyorkfed.org/research/staff_reports/sr255.html.

Yield Curve and Predicted GDP Growth, March 2015

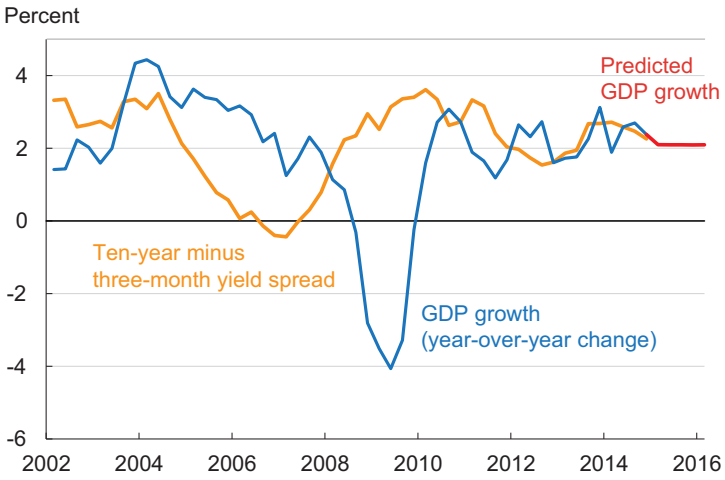
Covering February 21– March 20, 2015
by Joseph G. Haubrich and Sara Millington

Highlights

	March	February	January
Three-month Treasury bill rate (percent)	0.03	0.02	0.03
Ten-year Treasury bond rate (percent)	2.00	2.11	1.85
Yield curve slope (basis points)	197	209	182
Prediction for GDP growth (percent)	2.1	2.1	2.1
Probability of recession in one year (percent)	4.85	4.12	5.97

Sources: Board of Governors of the Federal Reserve System; authors' calculations.

Yield Curve-Predicted GDP Growth



Sources: Bureau of Economic Analysis; Board of Governors of the Federal Reserve System; authors' calculations.

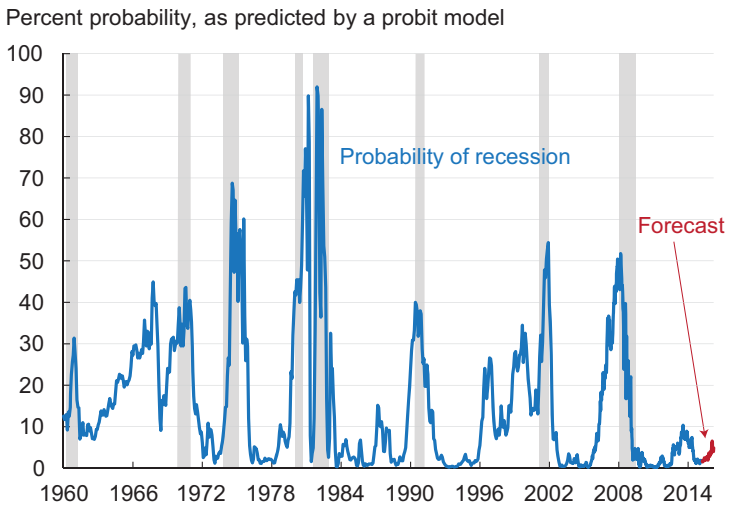
Overview of the Latest Yield Curve Figures

Who knows if it was the Ides of March, the coming of spring, or something else, but the yield curve gave back some of its previous steepening and turned flatter. As has been typical lately, most of the action was mainly at the long end, while the short end inched upward with the three-month (constant maturity) Treasury bill rate rising to 0.03 percent (for the week ending March 20), up from February's 0.02 percent and level with January's still low 0.03 percent. The ten-year rate (also constant maturity) dropped 11 basis points to an even 2.00 percent, down from February's 2.11 percent, but still noticeably higher than January's 1.85 percent. These changes dropped the slope to 197 basis points, down 12 basis points from February's 209 basis points, but still up from January's 182 basis points.

The flatter slope did not have a large impact on predicted real GDP growth; expected growth stayed constant. Past values of the spread and GDP growth suggest that real GDP will grow at about a 2.1 percent rate over the next year, the same as the previous two months. The influence of the past recession continues to push towards relatively low growth rates, but recent stronger growth is counteracting that push. Although the time horizons do not match exactly, the forecast is slightly more pessimistic than some other predictions, but like them, it does show moderate growth for the year.

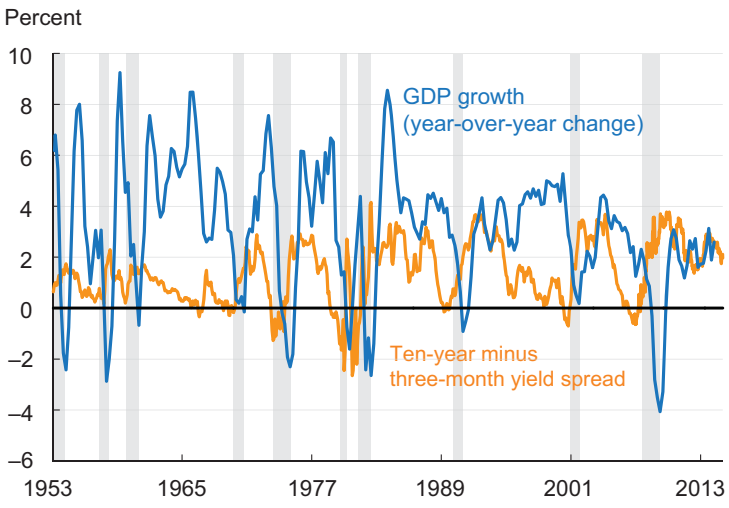
The flatter slope, however, had the usual effect on the probability of a recession, which decreased slightly. Using the yield curve to predict whether or not the economy will be in a recession in the future, we estimate that the expected chance of recession next March at 4.85 percent, up a bit from the February probability of 4.12 percent, though still lower than the January's figure of 5.97 percent. So although our approach is somewhat pessimistic with regard to the level of growth over the next

Recession Probability from Yield Curve



Source: Board of Governors of the Federal Reserve System; NBER; authors' calculations.

Yield Curve Spread and Real GDP Growth



Note: Shaded bars indicate recessions.
Sources: Bureau of Economic Analysis, Board of Governors of the Federal Reserve System.

year, it is quite optimistic about the recovery continuingour approach is somewhat pessimistic with regard to the level of growth over the next year, it is quite optimistic about the recovery continuing.

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. 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.

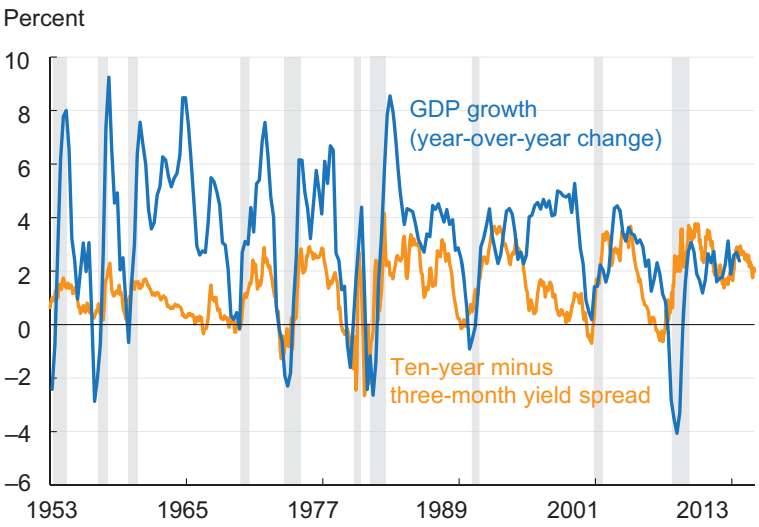
Predicting GDP Growth

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.

Yield Spread and Lagged Real GDP Growth



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 materially 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.

Trends in Energy Production and Prices

03.03.2015
by Stephan Whitaker and Christopher Vecchio

Natural gas and oil production has been increasing in the United States since 2009, while coal production has been falling. Contributing to these national trends are the four states of the Federal Reserve's Fourth District—Kentucky, Ohio, Pennsylvania, and West Virginia—which together produce 14 percent of the nation's natural gas and 28 percent of its coal. Changes in production have coincided with falling prices in residential natural gas and, more recently, gasoline prices. Some of these movements in production and prices have the potential to benefit various sectors of the Fourth District economy.

Between 2009 and 2014, US natural gas production expanded by 21 percent. The Fourth District played a significant role in this increase, with Pennsylvania's output rising from 274 billion cubic feet in 2009 to 3,259 billion cubic feet in 2013 (the most recent data available). Ohio and West Virginia also more than doubled their natural gas output. In contrast, US coal production was down from 2009 to 2014, and Kentucky, Ohio, and West Virginia's production levels all declined. The most extreme change in production has been seen in oil drilling, with total US output rising 59 percent from 2009 to 2014. Oil production in the Fourth District states jumped up by 158 percent but represents just 1 percent of the national total.

Turning from quantities to prices, oil, natural gas, and coal prices have taken disparate paths since 2009, according to the three commonly cited national price measures for these commodities. Wholesale natural gas prices declined during 2011, rose in 2012 and 2013, and fell in 2014. Coal prices have trended down since late 2010. Oil prices held steady after climbing out of their recession lows. All three prices declined during the last two quarters of 2014. The decline has been the most pronounced for oil, at 54 percent between June and January. Natural gas prices have fallen by 34 percent in these two quarters, and coal prices by 24 percent.

Production of Natural Gas, Coal, and Oil in Fourth District States

	Ohio		Pennsylvania		Kentucky		West Virginia	
	2009	2013	2009	2013	2009	2013	2009	2013
Natural gas	88.8	186.2	273.9	3,259.0	113.3	94.7	264.4	717.9
Coal	27.7	23.3	59.1	59.9	107.8	79.0	137.2	112.2
Oil	4.9	14.0	3.0	6.2	2.6	3.3	1.5	7.5

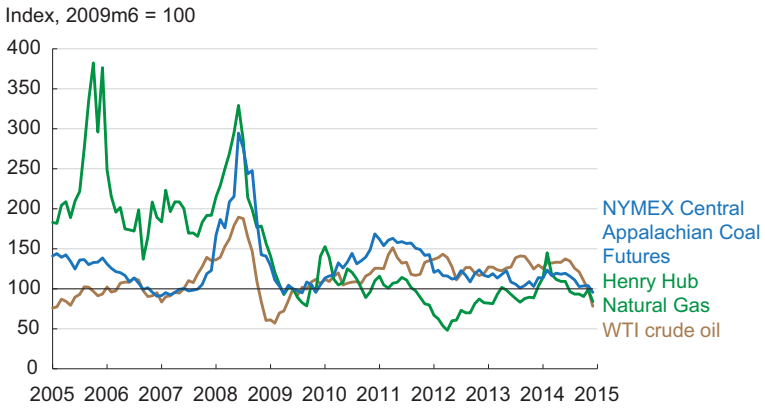
Units: Natural gas: billions of cubic feet; Coal: millions of short tons; Oil: millions of barrels.
Source: US Energy Information Administration.

Total US Production of Natural Gas, Coal, and Oil

	2009	2013	2014
Natural gas	26,056.9	30,005.3	31,562.1
Coal	1,073.0	982.7	987.3
Oil	1,952.7	2,718.6	987.3

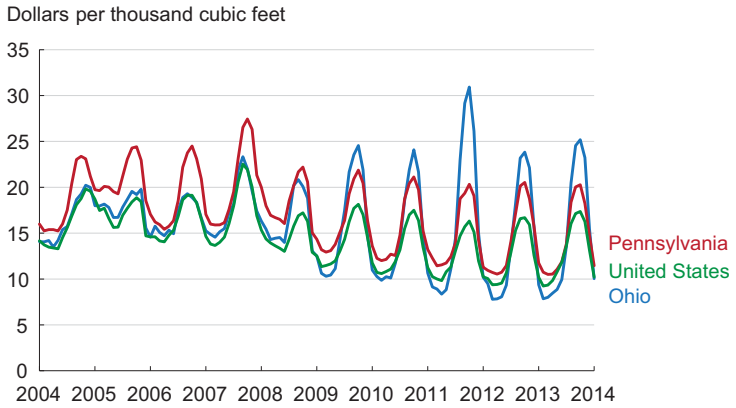
Units: Natural gas: billions of cubic feet; Coal: millions of short tons; Oil: millions of barrels.
Note: 2014 values are for December 2013–November 2014.
Source: US Energy Information Administration.

Oil, Coal, and Gas Prices



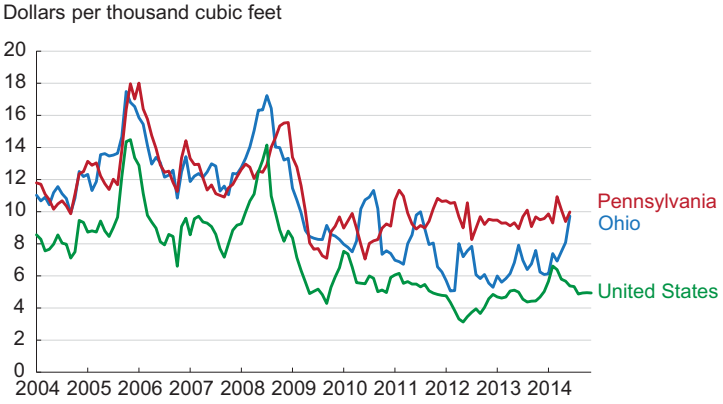
Note: All dollar values adjusted for inflation.
Sources: US Energy Information Administration; Wall Street Journal.

Residential Natural Gas Prices



Note: All dollar values adjusted for inflation.
Source: US Energy Information Administration.

Industrial Natural Gas Prices



Note: All dollar values adjusted for inflation.
Source: US Energy Information Administration.

We would expect movements in natural gas, oil, and coal prices to impact households through multiple channels including electric and natural gas bills and gasoline prices at the pump. However, residential natural gas prices have not followed the same down-up-up-down trend seen in the wholesale price. Rather, households have experienced price declines over the course of the 2009-2014 period. Nationally, residential prices during the heating season (the troughs on the chart below) declined by 19 percent between 2009 and January 2013, dropping from $11.02 to $8.93 per thousand cubic feet. In Ohio the decrease was 35 percent over the four years, while in Pennsylvania it was 25 percent. However, in every month of 2014, average residential prices were slightly above those in 2013 for customers in Ohio, Pennsylvania, and the nation.

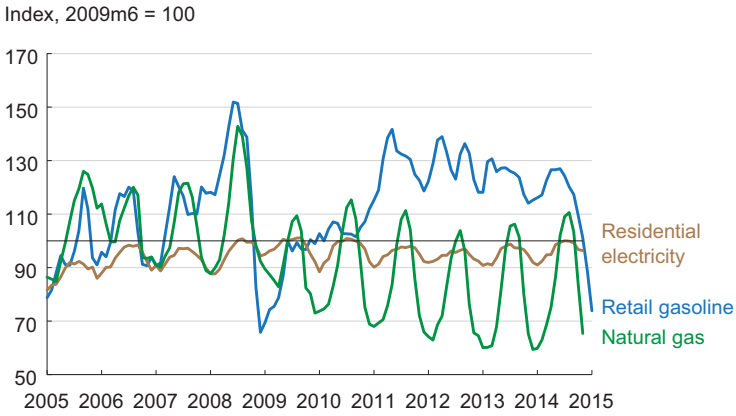
Industrial customers have seen declining natural gas prices in Ohio but rising prices in Pennsylvania. The average price during 2014 in Ohio was 25 percent lower than the average price during 2009. The Pennsylvania average in 2014 was 2 percent higher than the 2009 average. The national average price for industrial natural gas has followed the wholesale price.

The decline in residential natural gas prices from 2009 to 2013 could reflect the increase in supply. Utilities customers are not seeing similar savings in their electricity rates. Despite falling prices for coal, electricity rates have changed only slightly since 2009. Residential electricity rates were up 2 to 6 percent year-over-year during every month in 2014.

Gasoline prices have followed oil prices in their recent steep decline. The national average gasoline price plummeted 43 percent from a recent peak of $3.69 per gallon in June 2014 to a low of $2.11 in January 2015.

We have seen that coal production and prices have both fallen, while natural gas production has risen and its price movements have been mixed. Although many factors impact energy markets, substitution between the two fuels is very likely part of the explanation for these trends. Approximately 94 percent of coal and 30 percent of natu

Consumer Energy Prices



Note: All dollar values adjusted for inflation.
Source: US Energy Information Administration.

ral gas are used for electrical generation. Between 2009 and 2014, the megawatts generated with coal dropped by 150 million, an 8.6 percent decline. At the same, the megawatts generated with natural gas increased by 196 million, a 21 percent increase. If this substitution is driven by technological improvements in drilling that have made natural gas less expensive to extract, the savings should eventually appear in electricity rates.

Are Wages Flat or Falling? Decomposing Recent Changes in the Average Wage Provides an Answer

03.27.2015
by Joel Elvery and Christopher Vecchio

There recently has been a lot of concern about stagnant wages. Most of the discussion has focused on the median and average hourly wage, but these measures are sensitive to changes in the mix of occupations. For example, consider how average wages move during recessions. Demand for labor falls during recessions, and increased competition for the remaining jobs can push wages down. However, average wages often rise during recessions as firms lay off their less-skilled (and lower paid) employees while retaining their higher-skilled (and better paid) employees. In addition, over time there has been a steady up-skilling of the workforce, which has pushed the average wage higher. This article answers the question: What fraction of recent changes in the average wage is due to changes in the occupation mix versus changes in wages within occupations?

To answer questions like this, economists often use the Oaxaca-Blinder decomposition technique (Oaxaca is pronounced wa-ha-ka). This technique is frequently used to analyze wage differences between two groups, for example men and women. We use it to decompose the change in wages between years into two parts. One part is the change in the average wage due to within-occupation wage changes (as in the increased-competition scenario above), and the other is the change in the average wage due to changes in each occupation's share of employment (like the up-skilling scenario above). We do the decomposition for the United States, the four states in the Fourth District (Kentucky, Ohio, Pennsylvania, West Virginia), and the Cincinnati, Cleveland, Columbus, and Pittsburgh metropolitan areas.

We use data from the Bureau of Labor Statistics' Occupational Employment Statistics (OES), a survey of 1.2 million establishments over three years, which provides annual estimates of employment

levels and average wages for detailed occupations. Because of the overlap in the sample across years, we focus on just three years: 2007, 2010, and 2013. The 2007 to 2010 period captures the recession plus the first year of the recovery and the 2010 to 2013 period captures the rest of the recovery. The occupation codes used by OES changed between 2007 and 2010, so we combined some occupations to create time-stable occupation codes, giving us 785 detailed occupations. We adjust all wages to 2013 dollars to make it easier to compare values across time. For brevity, we call the "real average hourly wage" simply the "average wage."

We use the OES rather than the most common source of overall average wages, Current Employment Statistics (CES), because the CES lacks the occupational detail we need for the decomposition. But in the areas where they overlap, the two data sets give similar results. OES's estimate of the national average hourly wage in May 2013 is $22.81, $1.60 less than the CES estimate. This may be because the OES can underestimate the average wage of occupations with very high wages. The OES also shows less growth in average wages from 2011 to 2013, which is consistent with the evidence that recent wage growth has been stronger in high-wage occupations. That said, the OES and CES have similar wage trends from 2007 to 2013. Over this time, the average wage increased 1.7 percent in the OES and 1.9 percent in the CES.

Our analysis shows that for the United States as a whole, the average wage rose 1.5 percent from 2007 to 2013, which is slightly below the published OES estimate. If the mix of occupations were held fixed, the average wage would have declined 0.6 percent due to declines in within-occupation wages. If instead hourly wages within each occupation were held fixed, the average wage would have increased 2.1 percent due to increases in the share of employment in higher-wage occupations.

Looking at the states in the Fourth District over the same time period, we find that wages declined 0.6 percent in Ohio and rose 3.3 percent in Pennsylvania and West Virginia and 0.6 percent in Kentucky. In each state, increases in the share of employment in higher-wage occupations pushed the average

Decomposition of the Change in Real Average Hourly Wages, 2007–2013

Area	Actual Percent Change	Percent Change Due to Changes in	
		Wages	Occupational Mix
United States	1.5	−0.6	2.1
States			
Kentucky	0.6	−0.6	1.2
Ohio	−0.6	−3.5	2.9
Pennsylvania	3.3	1.2	2.1
West Virginia	3.3	0.8	2.5
Metro areas			
Cincinnati	−0.1	−3.6	3.4
Cleveland	−1.0	−3.8	2.8
Columbus	−0.2	−3.2	3.1
Pittsburgh	4.6	2.4	2.2

Note: Due to rounding, the percent change may not equal the sum of the wage and occupational mix components.
Source: authors' calculations from the Occupational Employment Statistics.

wage up, but in Ohio a 3.5 percent decline in the within-occupation wage was enough to make the average wage in the state fall.

A similar pattern is seen in the Cincinnati, Cleveland, and Columbus metro areas, where notable shifts to higher-wage occupations were not enough to offset falling wages within occupations, and average wages fell from 2007 to 2013. In Pittsburgh, within-occupation wage increases and shifts to higher-wage occupations contributed about equally to a 4.6 percent increase in the average wage over that time.

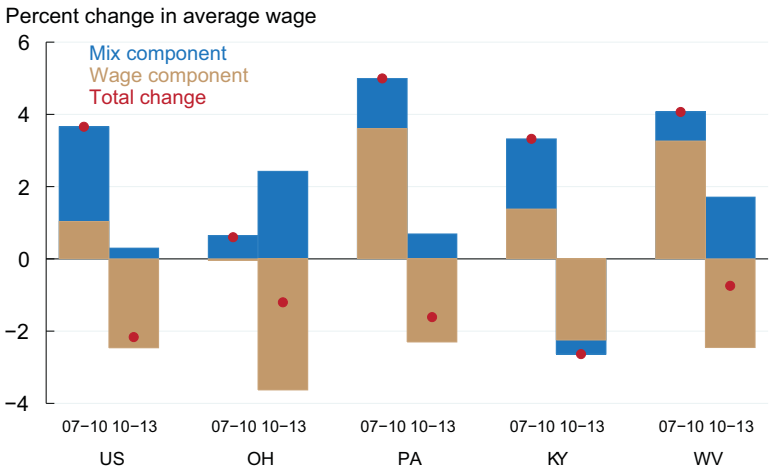
Next we divide this six-year period into two periods: 2007 to 2010 (the recession and the first year of the recovery) and 2010 to 2013 (recovery years). The figures below show the results graphically. The blue bars are the percent change in the average wage due to changes in the mix of occupations. The tan bars are the percent change in the average wage due to within-occupation wage changes. The red dots are the actual percent change in average wage, which is the sum of the two components. When both components have the same sign, the height of the stacked bars is the total change. When the wage and mix component have different signs, the dots representing the total change fall inside the bars.

In the United States, the average hourly wage rose 3.7 percent from 2007 to 2010 and fell 2.2 percent from 2010 to 2013. The increase in the average wage during the recession came from an increase in the share of employment in higher-wage occupations as well as rising wages within occupations. In the recovery, there was a 2.5 percent decline in the average wage due to within-occupation wage changes, and shifts in the occupational mix had a small positive effect (0.3 percent). This implies that, on average, people who did not change occupations experienced declines in their real hourly wage between 2010 and 2013.

Average wages rose during the recession and fell during the recovery in all four of the states in the Fourth District. The increases from 2007 to 2010 ranged from 0.6 percent in Ohio to 5.0 percent in Pennsylvania. The small increase in Ohio's average wage was due entirely to changes in the mix of occupations, while the increases in the other states

Decomposition of Change in Average Wage

Fourth District States and United States: 2007–2010 and 2010–2013



Source: Bureau of Labor Statistics and authors' calculations.

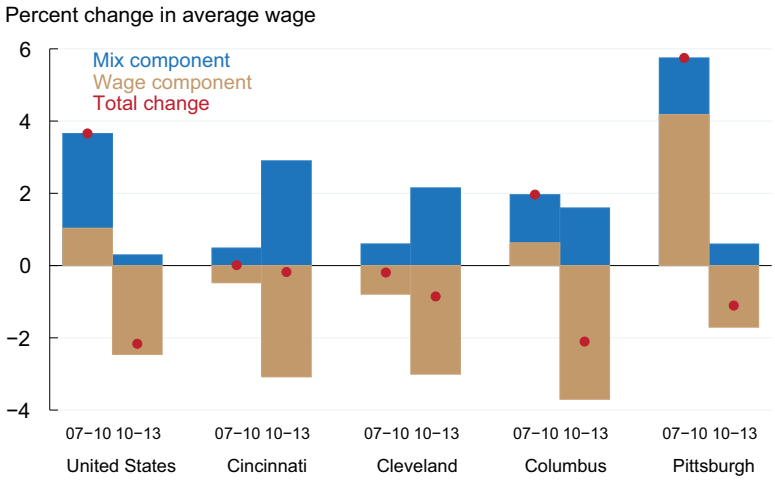
Decomposition of the Change in Real Average Hourly Wage, 2007–2010 and 2010–2013

Area	Actual Percent Change	Percent Change Due to Changes in		Actual Percent Change	Percent Change Due to Changes in	
		Wages	Occupational Mix		Wages	Occupational Mix
United States	3.7	1.0	2.6	−2.2	−2.5	0.3
States						
Kentucky	3.3	1.4	1.9	−2.6	−2.2	−0.4
Ohio	0.6	0.0	0.6	−1.2	−3.6	2.4
Pennsylvania	5.0	3.6	1.4	−1.6	−2.3	0.7
West Virginia	4.1	3.3	0.8	−0.7	−2.5	1.7
Metro areas						
Cincinnati	0.0	−0.5	0.5	−0.1	−3.1	2.9
Cleveland	−0.2	−0.8	0.6	−0.9	−3.0	2.2
Columbus	2.0	0.6	1.3	−2.1	−3.7	1.6
Pittsburgh	5.7	4.2	1.6	−1.1	−1.7	0.6

Note: Due to rounding, the percent change may not equal the sum of the wage and occupational mix components.
Source: authors' calculations from the Occupational Employment Statistics.

Decomposition of Change in Average Wage

Fourth District Metro Areas and US: 2007–2010 and 2010–2013



Source: Bureau of Labor Statistics and authors' calculations.

were due to both within-occupation wage increases and increases in the share of employment in higher-wage occupations. The declines in average hourly wages from 2010 to 2013 ranged from 0.7 percent in West Virginia to 2.6 percent in Kentucky. Though shifts to higher-wage occupations pushed the average wage up in Ohio and West Virginia during the recovery, it was not enough to counteract the effect of within-occupation declines in wages, which ranged from 2.2 percent in Kentucky to 3.6 percent in Ohio.

Wage growth and its components varied widely across the four largest metropolitan areas in the Fourth District. However, all had within-occupation wage declines during the later recovery years. These declines were large enough to make the average wage fall in each metro area even as their occupational mixes shifted toward higher-wage occupations. For example, in the Columbus metro area from 2010 to 2013, within-occupation wage changes reduced the average wage by 3.7 percent and the shift to higher-wage occupations increased the average wage by 1.6 percent, which nets to a 2.1 percent decline in the average wage.

In general, we find that real average hourly wages rose during the recession and fell during the recovery. The drop in the average wage between 2010 and 2013—which occurred in the US as a whole and all of the states and metropolitan areas we looked at—would have been more severe if there had not also been an increase in the share of employment in occupations with above-average wages.

Why did wages rise during the recession and fall during the recovery? It may be due to what are called "selection effects." During recessions, firms tend to retain their most productive workers, both across and within occupations. Furthermore, less productive firms are more likely to lay off workers during recessions, which would also increase average productivity within occupations. Wages are closely linked to productivity, so the selection effects that increase within-occupation productivity also increase within-occupation wages. As hiring increases during a recovery, people who were laid off during the recession—who tend to have lower productivity than people in the same occupation who remained employed—find new jobs, which would pull down the average productivity of the workers within an occupation.

It is also possible that wages declined more in the recovery than in the recession due to what economists call "sticky wages." Reducing real wages is one of the ways the labor market adjusts to drops in demand for labor. However, firms generally do not cut the wages of existing employees, so their real wages tend to decline only due to inflation. When the labor market is weak, firms can reduce the wages offered to new hires. As a result, the wages of new hires are more responsive to current labor market conditions than are the wages of existing employees. This implies that within-occupation wages would not change much during the recession due to low levels of hiring, but they could decline as firms hire new workers during the recovery. In this scenario, the within-occupation wage declines indicate just how weak the labor market was between 2010 and 2013.

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