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14. Assessing Inflation Expectations and the Risk of Deflation

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Executive Summary

Because it limits the lowering of real interest rates, the zero bound on nominal interest rates becomes a larger constraint on monetary policy if expected inflation is low relative to the central bank's inflation objective or if there is a high risk of deflation. We examine a number of different measures of the current level of expected inflation and the risk of deflation and provide some comparisons with the 2003 period. Overall we find that while inflation expectations have declined from somewhat elevated levels earlier this year, we see little hard evidence to date of expected deflation, once the large fall in energy prices and some technical factors are taken into account. However, among those indicators that suggest that the risks of deflation have increased are a number of survey measures and the Greenbook forecast distributions. This is perhaps significant because in earlier volatile periods the Greenbook forecast has been shown to be the most accurate measure of near-term inflation.² Lastly, many of the measures we consider do not take into account the surprisingly low reading for the core CPI in October implying that actual perceptions of deflation risks may be somewhat greater than reported here.

We report on four different measures:

1. Inflation expectations from financial markets
2. Inflation expectations from professional forecasters
3. Household inflation expectations
4. FRB/US and Greenbook estimates of deflation.

Inflation Expectations from Financial Markets

Five-year inflation compensation, as measured by the yield difference between nominal and inflation-indexed Treasury securities, is currently negative 1.1 percent per annum.³ Taken at face value, this reading suggests that investors are anticipating a decline of about 6 percent in the level of the CPI over the next five years. However, inflation compensation is, at best, a noisy measure of inflation expectations; it is also influenced by changes in inflation risk premia and differential liquidity conditions in the real and nominal Treasury securities markets. Indeed, the latter factor seems to have

¹ Fleming, Potter, Rodrigues, Van der Klaauw: Research, FRBNY; Steinberg Ezer: Markets, FRBNY; Roush: Division of Monetary Affairs.

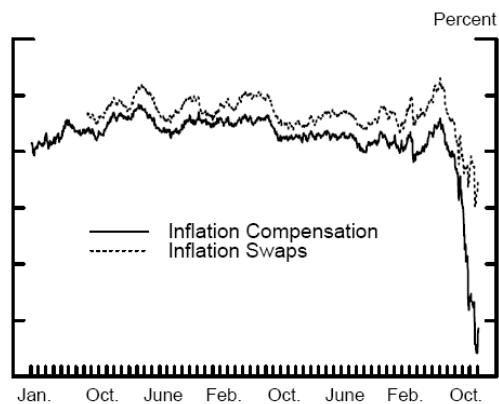
² See Christina D. Romer and David H. Romer (2000), "Federal Reserve Information and the Behavior of Interest Rates," *American Economic Review*, vol. 90 (June), pp. 429-57.

³ This value is adjusted for the lagged indexation of TIPS.

played a significant role in driving movements in inflation compensation in recent months.⁴

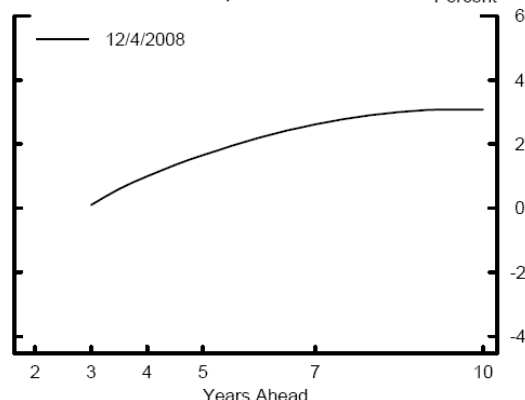
Exhibit 1 shows the substantial decline in five-year inflation compensation—from about 1.5 percent in mid-September to about -1 percent in recent days. While the decline coincided with economic data that was significantly weaker than market expectations, it also occurred during a period of severe strains in Treasury markets. As domestic and international financial markets experienced extreme volatility beginning in mid-September, investors reportedly flocked to nominal U.S. Treasury securities, driving down their yields. At the same time, anecdotal reports indicate that conditions deteriorated significantly in the TIPS market. In particular, dealers noted an increase in one-way flows, wider bid-ask spreads, and discontinuous price movements. Poor liquidity in TIPS relative to nominal Treasury securities causes investors to demand a higher return (or liquidity yield premium) to hold TIPS versus their more liquid nominal counterparts, thereby driving down inflation compensation. Indeed, amid the dramatic shifts in market conditions during September and October, TIPS yields rose rapidly even as the economic outlook worsened, suggesting that such effects were having an important influence on readings on inflation compensation.⁵

Exhibit 1: Five-year Inflation Compensation*



*Adjusted for the carry effect.

Exhibit 2: Term Structure of Implied One-Year Forward Inflation Compensation from TIPS



Note. Forward rates are the one-year rates maturing at the end of the year shown on the horizontal axis as implied by smoothed yield curves fitted to nominal and indexed Treasury securities and adjusted for the carry effect.

The size of this liquidity effect is difficult to estimate. An informal survey of TIPS traders and investors by the Desk indicates a widespread expectation of

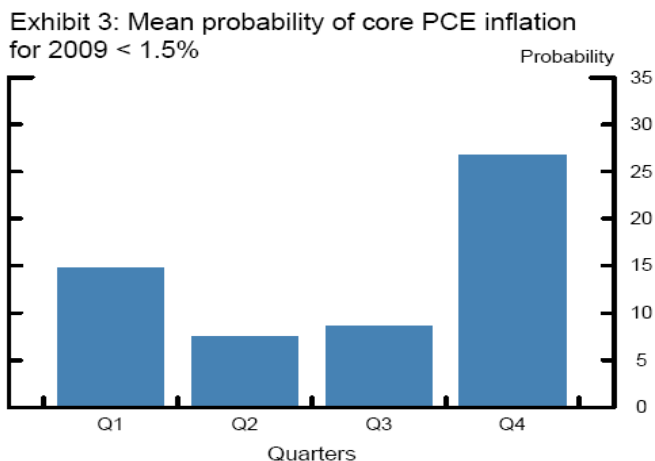
⁴ Inferences about the level of inflation compensation also are likely clouded by measurement problems. Fitting errors in the estimation of real and nominal yield curves have increased dramatically in recent months as investors have apparently been unable (perhaps due to balance sheet constraints) or unwilling (due to market volatility) to trade away noticeable price differences between otherwise very similar securities. As a consequence, inflation compensation may also be measured with error.

⁵ Board staff models suggest that, absent the liquidity yield premium, five-year inflation compensation would be about 2 percent. Although fitting errors for these models have been relatively large throughout the financial crisis and have risen of late, these errors are small relative to the change in inflation compensation over recent months, suggesting they provide a reasonably reliable estimate of the likely size of these effects. For additional discussion on this issue see “Liquidity Conditions Make it Difficult to Gauge Inflation Expectations from TIPS and Inflation Swaps” by Michelle Steinberg Ezer and Tony Rodrigues posted to FRBNY MarketSOURCE on November 19, 2008.

significantly lower levels of the CPI NSA index over the next few months, but a majority believes that the current level of inflation compensation in TIPS is overstating the degree of deflation expected by the market over the medium run. Measures of five-year inflation compensation from inflation swaps, which are not influenced by flight-to-quality flows in the Treasury market, were much less volatile over this period and currently point to a rate of about 1.5 percent annually over the next five years. Nonetheless this measure should also be interpreted cautiously because volume in the inflation swaps market is only a small fraction of that in TIPS market. Finally, exhibit 2 shows the implied forward structure of inflation compensation from TIPS. While the level is likely distorted by the considerations discussed above, the shape of the curve is consistent with the decline in energy prices driving the low values of five year inflation compensation.

Inflation Expectations from Professional Forecasters

With the confluence of technical factors affecting financial market measures of inflation expectations, survey measures may be more informative even if they are less timely. The most recent Survey of Professional forecasters (November 17th) and Blue Chip Survey (November 10th) showed large drops in near-term point forecasts of inflation consistent with the large drop in energy prices but longer term inflation forecasts showed little change and are close to the views on the Fed’s inflation objectives.⁶ The SPF had 8 forecasters out of 38 expecting core PCE inflation to be below 1.5 percent in 2009 with none expecting core inflation below 1 percent. However, 64 percent of respondents to the Blue Chip survey for November responded affirmatively to a special question on whether the percentage change in the CPI from year ago levels will fall to 1.0 percent or less sometime within the next 12 months. The last time this occurred in the U.S. was in the early 1960s.



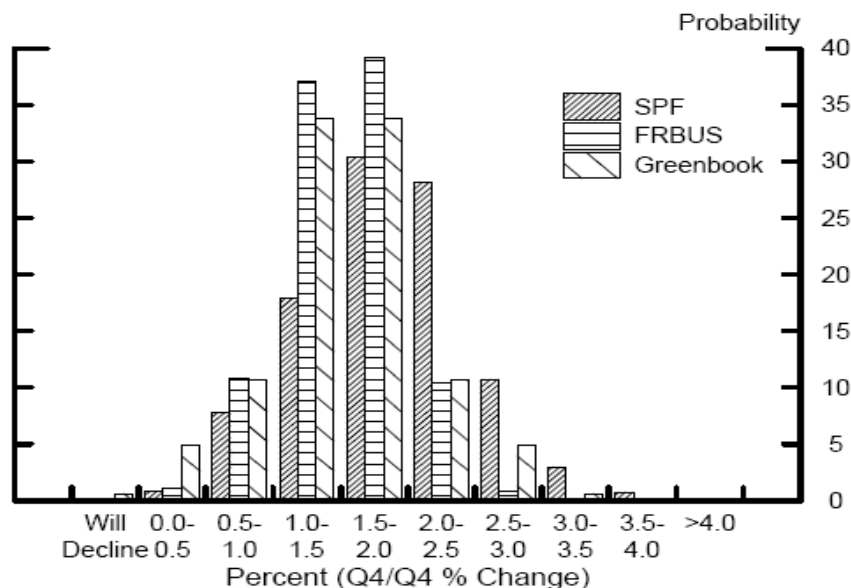
Source. Survey of Professional Forecasters (2008)

Risks of low inflation have also risen in the SPF, judging from responses to a question about forecast uncertainty about core inflation in 2009. Exhibit 3 compares the mean probability attached to core inflation below 1.5 percent for the four surveys

⁶ Both surveys were taken before the release of the October CPI.

conducted in 2008. In the most recent survey the mean probability increased substantially to 27 percent (using a matched sample that only includes the 19 forecasters who responded to all four surveys the probability is 21 percent). Exhibit 4 also compares the SPF core PCE inflation forecast distribution with the Greenbook and FRB/US forecast distributions from October. Professional forecasters are placing considerably less weight on core PCE below 1.5% than the Greenbook and FRB/US forecast distributions indicate.

Exhibit 4: Probabilities of core PCE inflation for 2009



Source. Survey of Professional Forecasters (2008 Q4), stochastic simulations of the FRBUS model and historical distribution of the Greenbook inflation forecast experience

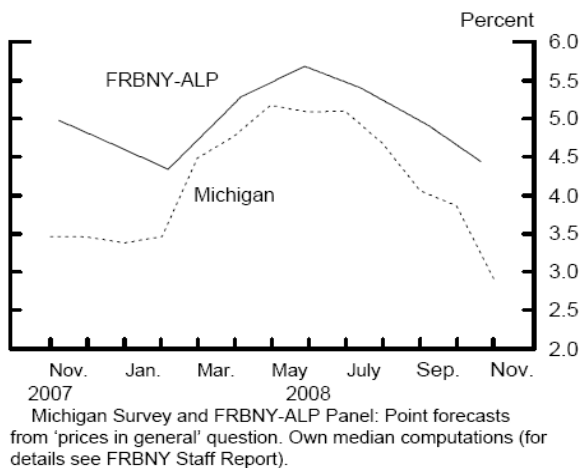
Household Inflation Expectations

We examine the behavior of two measures of household inflation expectations: the Reuters-Michigan, nationally representative random sample of around 500 households conducted each month by phone; and the FRBNY-ALP, a national panel of more than 200 households collected each six-week period over the Internet with a much larger set of questions on inflation expectations than the Michigan survey.⁷ Both the Michigan and the FRBNY-ALP surveys show a substantial decline in median year-ahead inflation forecasts from high levels earlier this year as can be seen in exhibit 5. In case of the FRBNY-ALP survey, the decline in median values is seen both when the question is worded in terms of the rate of inflation as well as the general price level. These declines in inflation expectations were likely strongly influenced by the abrupt decline in energy

⁷ This new survey is described in detail in “Rethinking the Measurement of Household Inflation Expectations: Preliminary Findings,” Federal Reserve Bank of New York Staff Report #359, December 2008. In addition to the Michigan style question about “prices in general”, it asks direct questions about the rate of inflation and on inflation uncertainty.

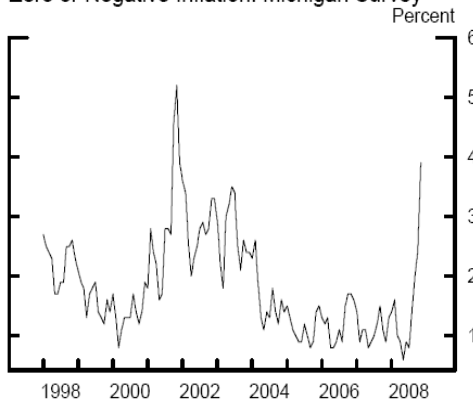
prices in recent months; the 5-to-10-year-ahead measure from the Michigan survey and the three-year-ahead from the FRBNY-ALP have declined less (not shown).⁸

Exhibit 5: Trends in Median Year-Ahead Forecast



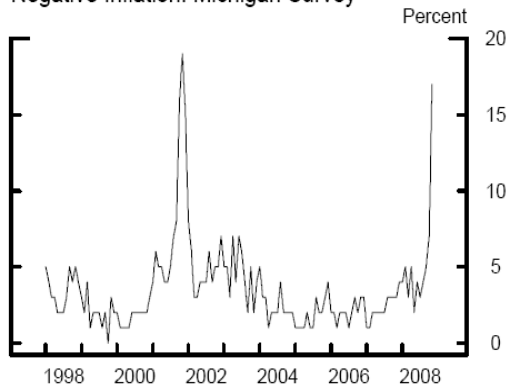
Regarding inflation risks, the proportion of respondents in the Michigan Survey reporting zero or negative point forecasts for prices in general over the next 12 months increased to 39 percent in November from a low of 5 percent in May. As shown in exhibit 6, the proportion of respondents giving zero or negative point forecasts during the previous period of low interest rates was 35 percent in June 2003 and the maximum proportion over the history of the survey is 52 percent in November 2001. Further, as shown in exhibit 7, 17 percent of the November Michigan respondents expected deflation over the next 12 months, similar to the record high in November 2001.

Exhibit 6: Proportion of Respondents Expecting Zero or Negative Inflation: Michigan Survey



Michigan Survey micro-data: proportion of year-ahead point forecasts with zero or negative expected changes in 'prices in general'.

Exhibit 7: Proportion of Respondents Expecting Negative Inflation: Michigan Survey

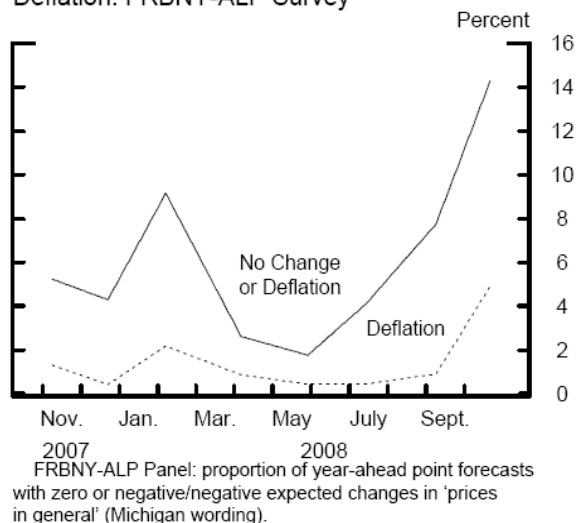


Michigan Survey micro-data: proportion of year-ahead point forecasts with negative expected changes in 'prices in general'.

⁸ Historically the Michigan median inflation expectation and recent lags of headline inflation exhibit a strong positive correlation, and recently movements in energy prices have been important in driving headline inflation.

The FRBNY-ALP survey shows a similar increase in deflation forecasts in recent months although the absolute proportions are lower (see exhibit 8). The discrepancy between the two survey results may be due to the fact that most of the latest responses in the FRBNY-ALP were submitted during the second half of October. A calculation using the Michigan survey mid-month readings suggests that the proportion of respondents in the Michigan survey expecting no change in prices or a decline increased from 21 percent in the first half of October to 42 percent in the second half of November.

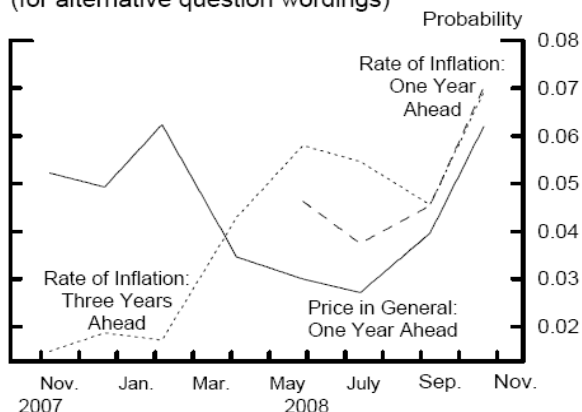
Exhibit 8: Proportion of Respondents Expecting Deflation: FRBNY-ALP Survey



The FRBNY-ALP survey indicates that the decline in inflation expectations and the increase in the proportion of respondents providing point forecasts of zero or negative inflation was accompanied by a recent increase in disagreement among respondents as well as an increase in overall individual inflation uncertainty. As shown in exhibit 9, the mean probability assigned by individual respondents to year-ahead deflation measured in the FRBNY-ALP survey has recently increased to the 6- to 7-percent range (depending on whether respondents are asked about prices in general or rate of inflation), a level similar to that seen in February 2008. During the latest survey period, the mean probability of deflation in 2010-11 was equal to that of one-year-ahead deflation.⁹

⁹ While the sharp increase in 3years-ahead deflation expectations in March 2008 is likely to reflect the severe deterioration of conditions in financial markets, part of the increase may reflect the addition in that month of a small number of brackets for negative inflation in the question eliciting density forecasts.

Exhibit 9: Average Probability of Deflation
(for alternative question wordings)



FRBNY-ALP Panel: Means across individuals of probability of deflation derived from individual density forecasts for changes in prices in general' (Michigan wording) and the 'rate of inflation'.

FRB/US and Greenbook Estimates of Deflation

The memo “Uncertainty Around the Greenbook Forecast and Alternative Simulations” that is distributed by the Board staff to Bank research directors prior to each FOMC meeting contains information on deflation risk in Table C. Two measures of deflation risk have been produced since January 2004: the probability of core PCE inflation below 0.5 percent on a Q4/Q4 basis; the joint probability of core PCE inflation below 0.5 percent and the unemployment rate above 6 percent in the last quarter of the year. As of the October Greenbook, the probabilities of these two events were equal in 2009 and were 0.01 and 0.05 using FRB/US errors and Greenbook errors, respectively, from the period from 1987 to 2007. Exhibits 10 and 11 graph the history of the time series of both measures of deflation risk. As can be seen, deflation risks were assessed to be a little higher in early 2004 but by the Greenbook error measure have increased quickly recently. Taking into account the deterioration in the outlook since the October Greenbook, a very large increase in the deflation risk is to be expected in the December Greenbook forecast distribution.

Exhibit 10: Probability of core inflation < 0.5% in following year

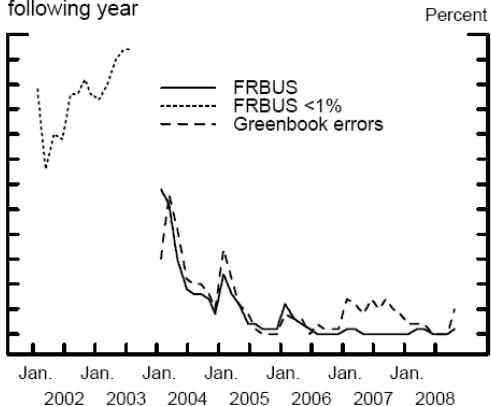


Exhibit 11: Probability of core inflation < 0.5% and unemployment rate > 6%

