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NOMINAL INCOME EXPECTATIONS OF CONSUMERS

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ABSTRACT

Proposals for nominal income targeting typically recommend that the central bank respond to nominal income forecasts as an intermediate target. Such forecasts could potentially come from the Greenbook prepared by the Federal Reserve staff or from a survey of professional forecasters or consumers. Although a large literature examines consumer survey measures of inflation expectations, much less work is done on consumer nominal income expectations. This paper documents key characteristics of income expectations from the Michigan Survey of Consumers. It compares a variety of potential methods for constructing a time series of consumer nominal income expectations from the survey microdata and suggests an income-weighted winsorized mean as the preferred measure. This measure is correlated with nominal GDP forecasts from the Survey of Professional Forecasters and the Greenbook, but with notable differences. I discuss the implications of these differences for nominal income targeting.

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DISCLAIMER

Nominal Income Expectations of Consumers

INTRODUCTION

Following the Great Recession of 2007 to 2009, many economists suggested that a nominal gross domestic product (NGDP) targeting framework would have resulted in a milder financial crisis and recession (Sumner 2012). An NGDP targeting framework would likely be forward looking, in the sense that policymakers would use forecasts of nominal income to set the policy interest rate, much like the way that inflation-targeting central banks rely on inflation forecasts as an intermediate target of monetary policy (Svensson 1997; Clinton et al. 2015). Such forecasts could come from a newly created NGDP futures market (Sumner 2018), but as Beckworth (2019, 21–22) notes, "more modest forecasting approaches could also be adopted. The Fed could use, at the monthly frequency, . . . the year-ahead household nominal income forecast from the University of Michigan consumer sentiment survey. Alternatively, at the quarterly frequency, the Fed could use the year-ahead NGDP forecast from the Philadelphia Federal Reserve Bank's Survey of Professional Forecasters (SPF)."

This paper considers the role that consumer nominal income expectations could play in an NGDP targeting framework. Every month, the Michigan Survey of Consumers (MSC) asks respondents for their expectations of their household income growth over the next 12 months. I suggest that these responses may be useful in guiding monetary policy if policymakers wish to stabilize nominal income. First, I note that there are several potential methods for constructing a time series of consumer nominal income expectations from the survey microdata. The median and mean are obvious candidates, possibly with winsorization to limit the influence of outliers. *Winsorization* refers to replacing outliers with set percentiles of a distribution. For example, values above the 95th and below the 5th percentile could be replaced with the 95th and 5th percentile values, respectively. I suggest a different measure, an income-weighted winsorized mean, which would be more theoretically relevant for forecasting future aggregate income.

A simple example illustrates the difference between the raw mean and income-weighted mean. Imagine there are only two consumers, one with an income of $1 and one with an income of $99. Suppose the low-income consumer expects 10 percent income growth and the high-income consumer expects 2 percent income growth. The raw mean of expected income growth is 6 percent. The two consumers expect income levels of $1.10 and $100.98 next year, respectively, implying that aggregate income is expected to grow from $100 to $102.08, or by 2.08 percent, which is the income-weighted mean. I show that the median, mean, winsorized mean, income-weighted mean, and income-weighted winsorized mean are all closely correlated (with correlation coefficients above 0.8), but the income-weighted winsorized mean has the most desirable properties. Thus, I use it in the remainder of my analysis as my preferred measure of consumer nominal income expectations.

Next, I document key characteristics of these expectations and how they compare to NGDP forecasts from the SPF and from the Federal Reserve's Greenbook. The SPF and Greenbook forecasts for NGDP are highly correlated with each other. Consumer nominal income expectations are also correlated with the SPF and Greenbook forecasts, but exhibit notable differences, especially in the aftermath of the Great Recession. Consumer income expectations fell sharply in the Great Recession and remained depressed for several years, even as the SPF and Fed forecasts for NGDP growth recovered. De Nardi et al. (2012) point to this exceptional and

long-lived decline in consumer income expectations as an explanation of the unusually slow recovery of consumption in those years.

Consumers also revised their personal household income expectations sharply downward at the start of the pandemic, but expectations returned to near prepandemic levels relatively quickly. Professional forecasters' expectations recovered even more quickly, rising to well above prepandemic levels. Previous work using alternative survey sources has shown that beliefs about the severity of the pandemic played a major role in shaping consumers' macroeconomic expectations in the early stages of the pandemic (Binder 2020a). Dietrich et al. (2022) find that consumer disagreement about the effect of the pandemic on GDP rose more quickly than professional forecaster disagreement in the early stages of the pandemic. After comparing these alternative measures of nominal income expectations, I consider implications for nominal income targeting. In particular, I start by extending the results of Hendrickson (2012), who shows that the post-Volcker Fed became more responsive to Greenbook forecasts of NGDP growth in setting the policy rate. I show that the Fed is still responsive to these forecasts in an extended time sample and that it is more responsive to Greenbook forecasts than to consumer forecasts. Then I use data from before the Great Recession to estimate the responsiveness of the policy rate to the Greenbook NGDP forecasts and use these estimates to construct implied paths of the policy rate from the Great Recession onward. I construct counterfactual paths using the same rule but with MSC or SPF forecasts instead of Greenbook forecasts. The MSC forecasts would have implied a more aggressive and longer-lasting policy easing in the Great Recession. In the COVID-19 pandemic, the MSC forecasts imply that current policy is roughly appropriate, whereas SPF forecasts imply the need for quicker tightening.

This paper is related to a broader literature on consumers' macroeconomic expectations. The expectations of consumers play important roles in many macroeconomic models (Armantier et al. 2015; Coibion et al. 2020). Around the world, central banks that use inflation targeting closely monitor consumer expectations, and in particular expectations of inflation, which are the subject of a large literature (Armantier et al. 2017; Kim and Binder 2023). Consumer inflation expectations may also play a role in determining consumption, but the evidence on the effects of inflation expectations on consumption is mixed (Binder and Brunet 2022). The literature on consumers' expectations of other economic variables, such as income, is more limited, however, despite the potentially important macroeconomic implications of these expectations. In an earlier article, I suggest that consumers may be more able to report meaningful forecasts of their nominal income and may find it easier to understand central bank communications about a nominal income target rather than an inflation target (Binder 2020c).

COMPARING MEASURES OF NOMINAL INCOME EXPECTATIONS

This paper uses expectations data from three sources: the Michigan Survey of Consumers (MSC), the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters (SPF), and the Greenbook. The MSC is conducted monthly, while the SPF is conducted quarterly, with responses due in the middle of the second month of each quarter. The Greenbook is prepared by the staff of the Federal Reserve Board of Governors for each Federal Open Market Committee (FOMC) meeting (typically eight meetings per year). In all the analysis that follows, the paper uses data at

quarterly frequency. For the MSC, all months of a quarter are pooled; for the Greenbook, the average forecast in each quarter is used.[1]

Consumer Forecasts

The MSC is a telephone survey of U.S. households. To solicit expectations of future nominal income growth, the survey first asks, "During the next 12 months, do you expect your income to be higher or lower than during the past year?" The follow-up question asks, "By about what percent do you expect your income to (increase/decrease) during the next 12 months?" The variable x_{it} denotes respondent i's expectation in quarter t for the percent change in income during the next 12 months. These data are available from 1978:Q1 to 2022:Q2. However, the income expectations question only began to be included every month in 1980:Q2, so this paper uses data from 1980:Q2 to 2022:Q4.

Researchers have a variety of options for constructing central tendency measures from the consumer survey microdata. In work on inflation expectations, the median is often preferred over the mean. The mean is more affected by extremely high responses, which result from bunching at multiples of 5 percent (Binder 2017) and from the excessively high inflation forecasts of pessimistic consumers (Binder 2020b). As a result, the median is lower and closer to realized inflation and to professional forecasters' expectations. But it is not necessarily the case that the median is similarly advantageous for nominal income expectations, which have different distributional properties. In particular, a large share of consumers (27 percent) report a 0 percent forecast for nominal income growth (versus 17 percent for inflation).[2]

Thus, I compare the median nominal income expectation to several other measures: a raw mean, a winsorized mean, an income-weighted mean, and an income-weighted winsorized mean.[3] For the winsorized mean, I winsorize the top and bottom 5 percent of responses in each quarter (replacing them with the 95th and 5th percentile values) to reduce noise from extremely high or low responses. The income-weighted measures are theoretically motivated. Because each consumer reports a forecast for his or her *personal* income growth, an income-weighted mean corresponds more closely to a forecast of aggregate GDP growth. Each consumer also reports his or her current income level Y_{it}, implying a forecast of income level $Y_{i,t+4} = Y_{it}(1 + x_{it}/100)$ in four quarters. A forecast for average income in four quarters is the mean across respondents of $Y_{i,t+4}$, or $\bar{Y}_{t+4}$. Forecasted aggregate income growth is then $(\bar{Y}_{t+4} - \bar{Y}_t)/\bar{Y}_t * 100\%$, the income-weighted mean. The winsorized income-weighted mean is computed in the same way, but both Y_{it} and x_{it} are winsorized at the 5th and 95th percentile by quarter.

Time series of all measures are in figure 1, while table 1 presents their summary statistics and correlations with each other and with realized NGDP growth over the next year. All the expectations measures are highly correlated with each other and have similar correlations (around 0.3) with realized NGDP growth over the next year.[4] The median is substantially lower than the

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[1] Results are robust to instead using data from only the first or only the second meeting of each quarter. These forecast series all have correlation coefficients of greater than 0.98.

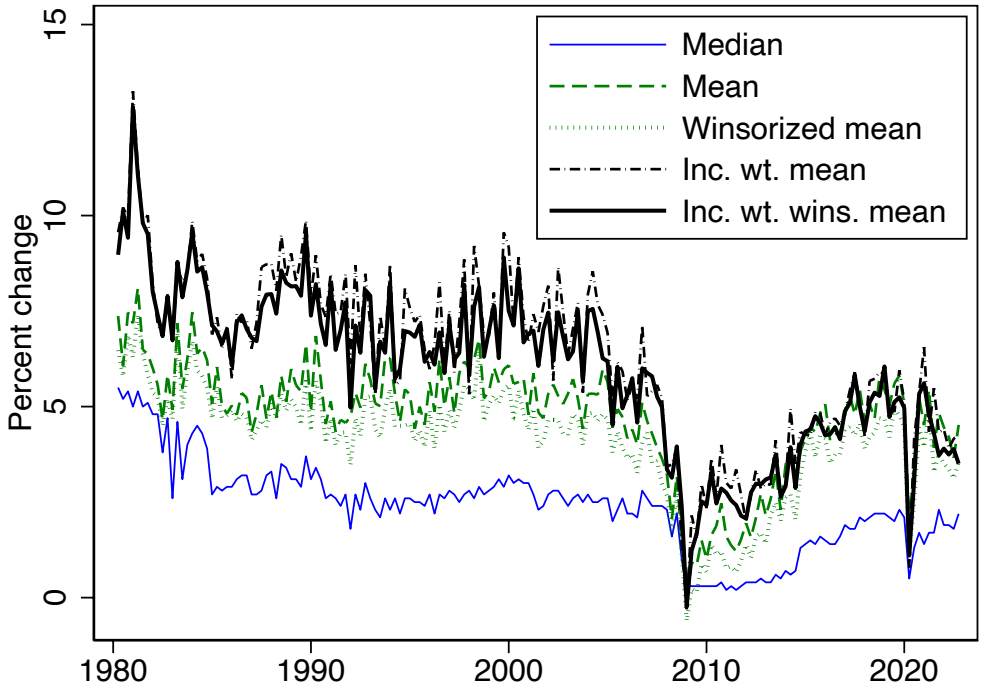
[2] The histogram in figure A.1 shows a large spike at 0 percent and smaller spikes at other multiples of 5 percent.

[3] The median is provided by the Michigan Survey with variable name inex_med_all. Observation weights are also provided by the Michigan Survey.

[4] Table A.1 shows the correlations of the income-weighted winsorized mean with other nominal income measures, including both current and realized future NGDP growth, personal income growth, and growth in employee compensation.

mean measures, with an average value of 2.4 percent. The mean and winsorized mean have average values of 4.8 percent and 4.1 percent. These are still lower than realized NGDP growth, which averages 5.3 percent over this period. The raw mean and income-weighted winsorized mean have the lowest mean absolute errors over the full time sample.

FIGURE 1. Median and Mean Consumer Income Growth Expectations



Source: Data are from Michigan Survey of Consumers, 1980:Q2 to 2022:Q4.

Note: Winsorized mean uses winsorization at 5th and 95th percentile by quarter. Inc. wt. mean = income-weighted mean. Inc. wt. wins. mean = income-weighted winsorized mean. For definitions of income-weighted and income-weighted winsorized means, see text.

TABLE 1. Correlations between Measures of Consumer Income Expectations and Realized NGDP Growth

Variable	Correlation with . . .					Variable Mean (Std. Dev.)		Mean Abs. Err.
	Realized	Med.	Mean	Wins. Mean	Inc. Wt. Mean			
Realization	1					5.3%	(3.0%)	
Median	0.33					2.4%	(1.2%)	3.4
Mean	0.30	0.85				4.8%	(1.5%)	2.0
Wins. mean	0.31	0.88	0.98			4.1%	(1.5%)	2.2
Inc. wt. mean	0.33	0.86	0.86	0.87		6.4%	(2.2%)	2.3
Inc. wt. wins. mean	0.33	0.90	0.88	0.91	0.98	6.0%	(2.1%)	2.1

Source: Data are from Michigan Survey of Consumers, 1980:Q2 to 2022:Q4.

Note: The table shows the correlation coefficients between various central tendency measures of consumer nominal income expectations and realized NGDP growth. The last columns show the time series mean and standard deviation of each variable and its mean absolute error. Wins. mean = winsorized mean. Inc. wt. mean = income-weighted mean. Inc. wt. wins. mean = income-weighted winsorized mean. Winsorized mean uses winsorization at 5th and 95th percentile by quarter. For definitions of income-weighted and income-weighted winsorized means, see text.

The income-weighted and winsorized income-weighted means are larger, with average values of 6.4 percent and 6.0 percent, respectively. The gap between the income-weighted and unweighted means reflects differences in income growth expectations across the income distribution. In general, income growth expectations are non-monotonic in income. As shown in figure A.2, income growth expectations decrease with income in the lower parts of the income distribution but increase with income at the top of the income distribution. Because the very high-income consumers' expectations are heavily weighted, the net effect is that income-weighted expectations are higher than unweighted expectations, though this gap is smaller after 2015.[5]

Professional and Greenbook Forecasts

SPF respondents provide NGDP forecasts at several forecast horizons. I construct forecasts of NGDP growth over the next year from the forecasts of NGDP growth in the current and next three quarters.[6] The variable x_t^{SPF} denotes the mean SPF forecast made at time t of NGDP growth over the next 12 months.

Greenbook forecasts for the real GDP growth rate and for the growth rate of the GDP deflator price index are also provided at several quarterly horizons. The sum of these two growth rates is the forecast for the growth rate of NGDP. I let x_t^{GB} denote the Greenbook forecast made in quarter t of NGDP growth over the next 12 months, again constructed from the forecasts of quarter-over-quarter

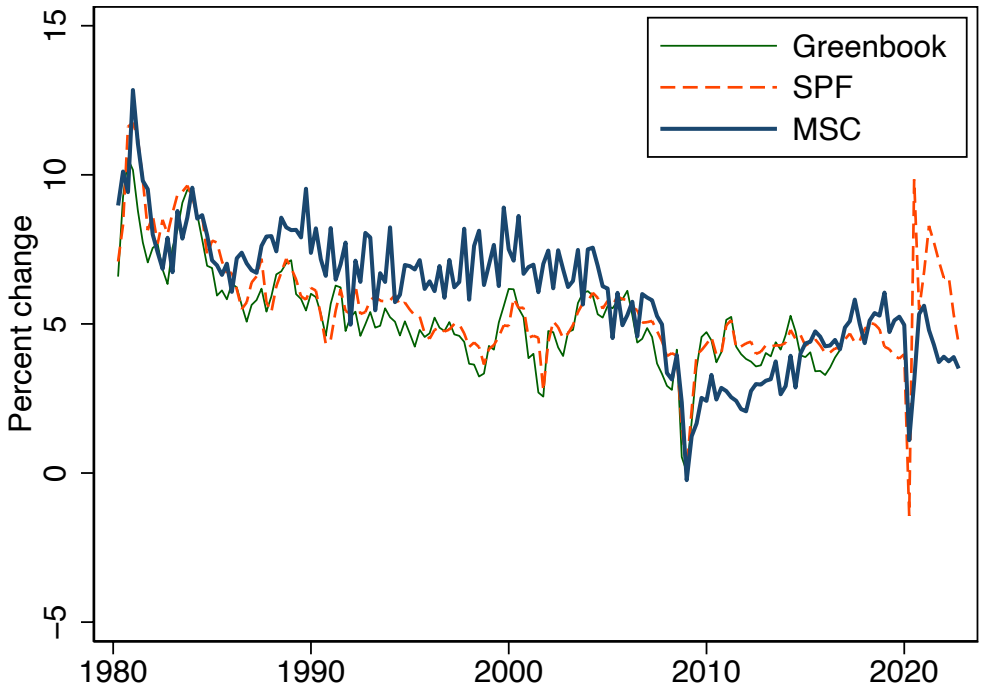
[5] A microdata regression of expected income growth on real income, real income squared, and time fixed effects results in a negative coefficient on the linear term and a positive coefficient on the quadratic term. The coefficient estimates imply that expected income growth declines with income up to an income of about $316,520 (in 2022 dollars) and increases with income thereafter.

[6] From https://www.philadelphiafed.org/surveys-and-data/ngdp, I use the file "Annualized Percent Change of Mean Responses," and let $x_t^{SPF} = (NGDP\ 2 + NGDP\ 3 + NGDP\ 4 + NGDP\ 5)/4$.

growth in the current and next three quarters.[7] Greenbook forecasts are released with a delay of at least five years; as of January 2023, forecasts are available from 1969:Q3 through 2016:Q4.

Figure 2 shows the Greenbook, SPF, and MSC nominal income forecasts over time, and table 2 reports their correlations. I use the income-weighted winsorized mean as the preferred MSC measure of nominal income expectations, because it is the most theoretically relevant measure and is close in mean to realized NGDP growth, and I denote this variable x_t^{MSC}. The Greenbook and SPF series are very highly correlated with each other and have approximately equal mean absolute errors: 1.5 for both in 1980:Q2 through 2016:Q4. This observation is consistent with the literature finding a slight forecasting advantage of central banks over professional forecasters; for a review, see (Binder and Sekkel 2023). The mean absolute error for x_t^{MSC} is 1.9,[8] and this series has a positive but smaller correlation with both x_t^{GB} and x_t^{SPF}.

FIGURE 2. Nominal Income Expectations of the Fed, Professional Forecasters, and Consumers



Source: Data are from the Greenbook, the Survey of Professional Forecasters (SPF), and the Michigan Survey of Consumers.

Note: The figure shows one-year NGDP growth forecasts from the Greenbook and the SPF, and one-year nominal income growth expectations from the MSC, at quarterly frequency from 1980:Q2 to 2022:Q4 (Greenbook data publicly available only through 2016:Q4).

[7] From https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/philadelphia-data-set, I use the file "Philadelphia Fed's Greenbook Data Set: Row Format." Then $x_t^{GB} = (gRGDPF\ 0 + gRGDPF\ 1 + gRGDPF\ 2 + gRGDPF\ 3 + gPGDPF\ 0 + gPGDPF\ 1 + gPGDPF\ 2 + gPGDPF\ 3)/4$.

[8] Note that this mean absolute error is slightly lower than the value reported in table 1 because the time sample is slightly shorter.

TABLE 2. Correlations between Nominal Income Expectations of the Fed, Professional Forecasters, and Consumers

Variables	MSC	SPF
SPF	0.61	
Greenbook	0.64	0.96

Source: Data are from the Greenbook, the Survey of Professional Forecasters, and the Michigan Survey of Consumers.

Note: The table reports the correlation coefficients, at quarterly frequency, between nominal income expectations from the Greenbook, the Survey of Professional Forecasters (SPF), and the Michigan Survey of Consumers (MSC).

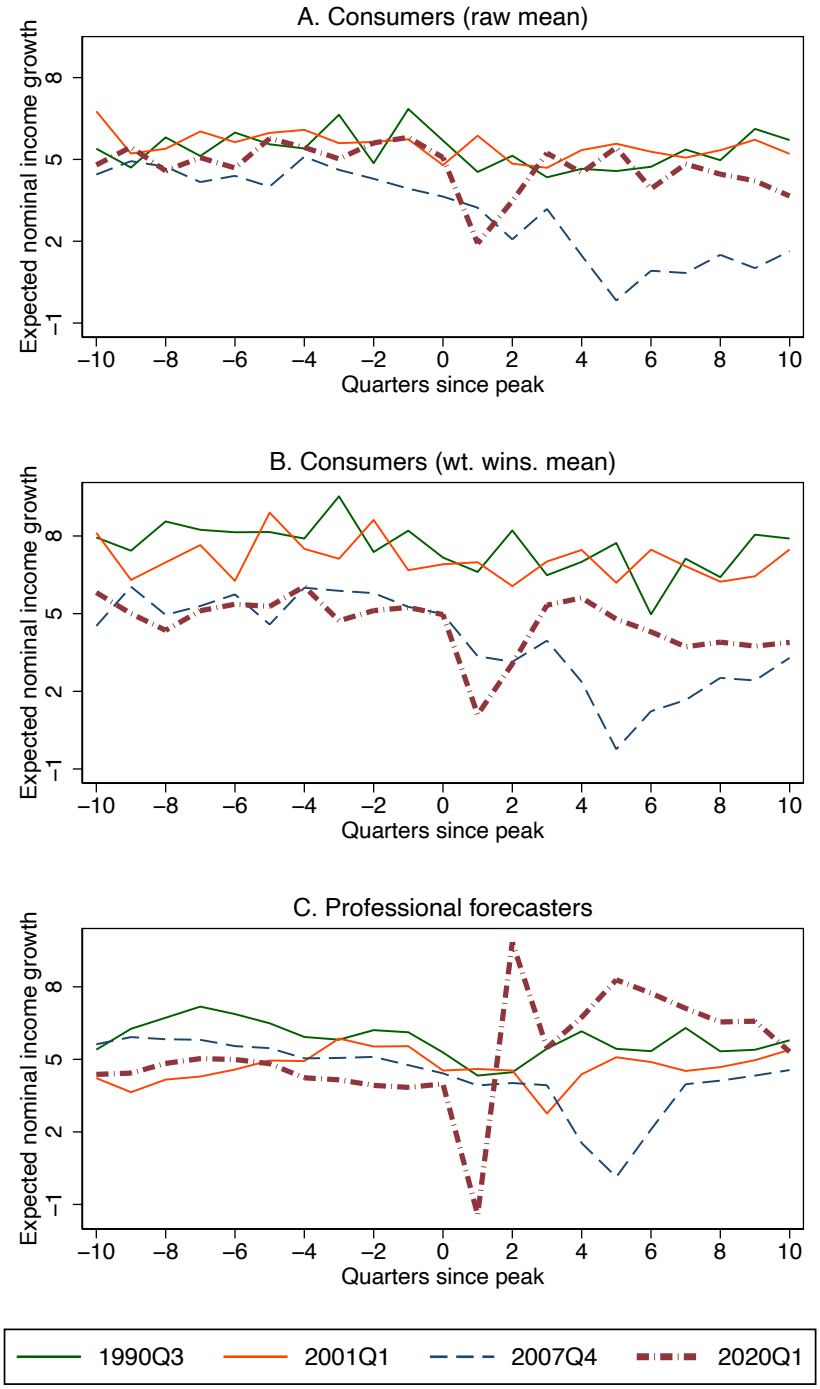
Nominal Income Expectations in the Great Recession and COVID-19 Recession

De Nardi, French, and Benson (2012) show that MSC nominal income expectations remained depressed for far longer after the Great Recession than after previous recessions. They use the National Bureau of Economic Research business cycle dates to identify business cycle peaks in 1980:Q1, 1981:Q3, 1990:Q3, 2001:Q1, and 2007:Q4, and they plot the mean MSC income expectation in the 16 quarters before and after each peak.

The first panel of figure 3 replicates figure 9 of De Nardi, French, and Benson (2012) but also includes data from the COVID-19 recession. For visual clarity, I omit the 1980s recessions and shorten the window to 10 quarters before and after the peak. Panel B uses my preferred consumer income expectations measure, the income-weighted winsorized mean, instead of the raw mean. Panel C uses NGDP growth forecasts from the SPF. The panels illustrate the unusual nature of the Great Recession. By either measure, consumer income expectations declined more notably and for far longer than in other recessions. SPF expectations also took longer to recover than in previous recessions, but they recovered more quickly than consumer expectations.

In the most recent recession, the decline in expectations was much steeper, but the recovery was also quicker. For professional forecasters, NGDP growth expectations after the recession are notably higher than before the recession, a unique occurrence. This rise in professional forecasters' NGDP expectations largely reflects their higher inflation expectations. For professional forecasters and the Fed staff, as shown in figure A.4, NGDP growth forecasts are positively correlated with inflation forecasts. For consumers, nominal income expectations and inflation expectations are negatively correlated in recent years. Again, this negative correlation may reflect consumers' lack of understanding of inflation or difficulty in incorporating inflation into their expectations of other variables.

FIGURE 3. Nominal Income Expectations around Recessionary Periods



Source: Data are from the Michigan Survey of Consumers and the Survey of Professional Forecasters (SPF).

Note: Figure shows the raw mean (panel A) or income-weighted winsorized mean (panel B) for consumer expectations of nominal income growth or the SPF forecasts of NGDP growth (panel C) in the quarters surrounding recessions. Panel A replicates figure 9 of De Nardi, French, and Benson (2012), adding data from the COVID-19 recession.

IMPLICATIONS FOR NGDP TARGETING

Hendrickson (2012) shows that the Great Moderation, from 1984 through 2007, was characterized by a reduction in volatility of nominal income. He finds that the federal funds rate (FFR) was more responsive to the Greenbook forecast of nominal GDP in the post-Volcker period (1979:Q4–2003:Q4) compared with the pre-Volcker period (1966:Q1–1979:Q3). The hypothesis that monetary policy became more responsive to nominal income forecasts implies that in a regression of the federal funds rate on the Greenbook forecast for nominal GDP growth, the coefficient β should have increased:

$$FFR_t^* = \alpha + \beta x_t^{GB} + \epsilon_t, \tag{1}$$

where FFR_t^* is the long-run federal funds rate target at time t and x_t^{GB} is the Greenbook forecast for nominal GDP growth made at the start of the quarter. Because the Fed tends to smooth the federal funds rate, Hendrickson models the federal funds rate as a weighted average of its past value and the long-run target:

$$FFR_t = \rho FFR_{t-1} + (1 - \rho)\, FFR_t^*. \tag{2}$$

Substituting equation (1) into (2), Hendrickson estimates a regression of the form:

$$FFR_t = \rho FFR_{t-1} + (1 - \rho)(\alpha + \beta x_t^{GB}) + \epsilon_t \tag{3}$$

$$= \rho FFR_{t-1} + \tilde{\alpha} + \tilde{\beta} x_t^{GB} + \epsilon_t, \tag{4}$$

where $\tilde{\alpha} = \alpha(1 - \rho)$ and $\tilde{\beta} = \beta(1 - \rho)$, and ϵ_t is the error term. Hendrickson finds that the estimate of β more than doubles from the pre-Volcker to the post-Volcker era.

I also estimate several versions of equation (4), but with updated data and alternative expected nominal income measures, including from the MSC. For comparability of the Greenbook and MSC measures, I use one-year forecasts made in the previous quarter.[9] In columns (1) and (2) of table 3, I use the time sample for which both Greenbook and MSC forecasts are available: 1980:Q2 to 2016:Q4. The coefficient on Greenbook forecasts is larger than that on MSC forecasts and implies a β estimate of 3.4, versus 1.3 for the MSC forecasts.[10] When Greenbook and MSC forecasts are included in the same regression, in column (3) both have a positive coefficient, but only the coefficient on the Greenbook forecast is statistically significant. The same result is found in column (4), which excludes the zero lower bound period. This observation indicates that the central bank does appear to respond to its own NGDP growth expectations more than to consumer expectations.

[9] Hendrickson uses one-quarter forecasts made at the start of the current quarter. My results are similar if I use forecasts made in the current quarter rather than in the previous quarter.

[10] This observation does not simply reflect the greater variance of MSC versus Greenbook forecasts. If both series are normalized to have the same mean and standard deviation, the coefficient on the Greenbook forecasts remains more than twice as large as that on MSC forecasts.

TABLE 3. Response of Federal Funds Rate to Nominal Income Expectations

	(1)	(2)	(3)	(4)	(5)
	FFR	FFR	FFR	FFR	FFR
Lagged FFR	0.86***	0.90***	0.83***	0.80***	0.87***
	(0.04)	(0.04)	(0.05)	(0.06)	(0.04)
Greenbook	0.34***		0.32***	0.41***	
	(0.10)		(0.09)	(0.11)	
MSC		0.13*	0.07	0.07	0.09
		(0.07)	(0.06)	(0.09)	(0.06)
SPF					0.15***
					(0.05)
Constant	−1.16***	−0.44	−1.35***	−1.70**	−0.86**
	(0.38)	(0.29)	(0.47)	(0.68)	(0.34)
N	148	148	148	120	171
R^2	0.96	0.96	0.96	0.95	0.96
Sample	1980:Q2–2016:Q4	1980:Q2–2016:Q4	1980:Q2–2016:Q4	1980:Q2–2008:Q4 2016:Q1–2016:Q4	1980:Q2–2022:Q4

Source: Data are from the Greenbook, the Survey of Professional Forecasters (SPF), and the Michigan Survey of Consumers (MSC).

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Dependent variable is the federal funds rate (FFR) in quarter *t*. Greenbook and SPF are one-year NGDP growth forecasts from the Greenbook and the SPF, respectively. MSC is the income-weighted winsorized mean nominal income expectation from the MSC.

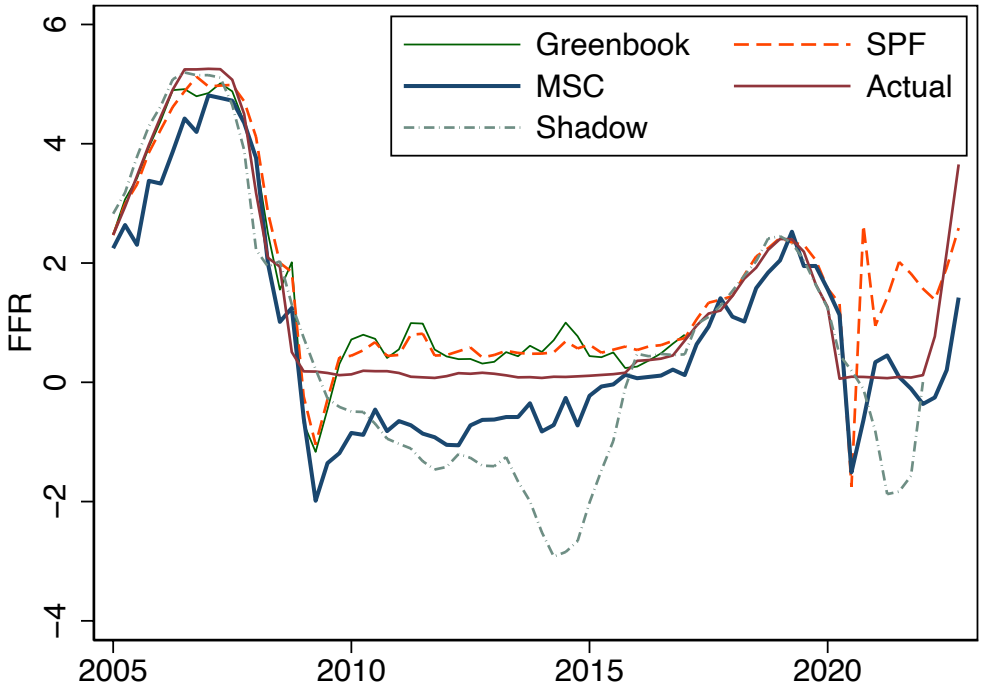
In column (5), I extend the time sample to 2022:Q4 by replacing the Greenbook forecasts with SPF forecasts, which tend to be quite similar. The federal funds rate is more responsive to the SPF than the MSC forecasts.

Recall from figure 2 that the consumer forecasts differed substantially from the Greenbook and SPF forecasts in the recovery from the Great Recession, and again in the COVID-19 pandemic. I consider how the path of the policy rate would have differed if the Fed had responded to MSC rather than Greenbook forecasts. In particular, I normalize the Greenbook, MSC, and SCF forecasts to have mean 0 and standard deviation 1 over the period 1980:Q2 to 2007:Q4. Then I estimate equation (2) using normalized Greenbook forecast data from 1980:Q2 to 2007:Q4. I use the estimated coefficients $\rho = 0.81$, $\hat{\alpha} = 1.1$, and $\hat{\beta} = 0.64$ to construct implied paths of the federal funds rate for each normalized forecast series. That is, $FFR_t^j = 0.81 FFR_{t-1} + 0.64 z_t^j + 1.1$, where $j \in \{GB, MSC, SPF\}$ and z_t^j is the normalized one-year nominal income forecast of group j.

Figure 4 shows the actual path of the federal funds rate and the implied paths FFR_t^{GB}, FFR_t^{MSC}, and FFR_t^{SPF} since 2005, as well as the Wu and Xia (2016) shadow federal funds rate, which

incorporates the effects of unconventional monetary policy and can be negative. Figure A.3 shows these paths since 1980, and also the implied paths of FFR^*, the long-run federal funds rate target (equation [1]). Rate cuts brought the federal funds rate to the zero lower bound (ZLB) in 2008:Q4, where it remained until 2015:Q4. The MSC path implies that the liftoff from the ZLB would have occurred later, in 2017:Q2, if the Fed had responded to consumer forecasts, using the same reaction function coefficients.

Figure 4. Federal Funds Rate Paths under Alternative Expectations Measures



Source: Data are from the Greenbook, the Survey of Professional Forecasters (SPF), the Michigan Survey of Consumers (MSC), and Wu and Xia (2016).

Note: The figure shows the actual path of the federal funds rate (FFR) and paths implied by a policy rule as in equation (4), where coefficients are estimated using normalized Greenbook forecast data from 1980:Q2 to 2007:Q4. Coefficient estimates are used to construct fitted values of the federal funds rate path implied by using normalized Greenbook, MSC, and SPF forecasts. "Shadow" refers to the Wu and Xia (2016) shadow federal funds rate.

When the Fed was constrained by the ZLB, it took unconventional measures to ease monetary policy. The shadow federal funds rate eventually fell below −2 percent in 2014. Had the Fed targeted nominal income forecasts, it might have eased policy even more drastically by early 2009, because the MSC path implies below-zero interest rates throughout the ZLB period, with a minimum of −2.0 percent in 2009:Q2. The Greenbook and SPF paths also have minima in 2009:Q2, of −1.2 percent and −1.0 percent, respectively, but both imply targets of around 50 basis points through 2015. Responding to the nominal income forecasts of consumers would have resulted in the most aggressive easing. Of course, nominal income expectations are endogenous to

the policy response—had the Fed eased more aggressively in early 2009, nominal income expectations may have recovered more quickly, enabling an earlier liftoff from the ZLB.

At the start of the COVID-19 pandemic, x_t^{MSC} and x_t^{SPF} both fell dramatically, suggesting a sharp cut in the policy rate to −1.8 percent (SPF) or −1.5 percent (MSC). SPF forecasts recovered so quickly that they imply a drastic rate hike by the end of 2020, while MSC forecasts imply that near-zero rates were warranted through the second quarter of 2022. Consumers may be more pessimistic than professional forecasters about the path of the pandemic and economic recovery. They also may not fully incorporate higher inflation into their nominal income expectations as professional forecasters would. The most recent federal funds rate hikes have raised the policy rate substantially higher than that implied by a policy rule responding to consumer expectations.

DISCUSSION AND CONCLUSIONS

The idea of using nominal income forecasts to guide policy is not new. Hall and Mankiw (1994, 78) explain, "The spirit of such a rule is that policy is too expansionary when today's forecast of nominal income a year or two hence is above the target for that time. . . . The feedback loop from current monetary policy to current forecasts of nominal income a year or two in the future is quick and powerful. It takes many months for monetary policy to affect actual income, but the consensus forecast that far in the future is quite responsive to current monetary policy."

Today, monetary policymakers rely on a wide variety of data to guide their policy responses. Increasingly, this information includes survey data on consumer expectations. Data on consumer expectations of nominal income may be particularly useful for central banks considering nominal income targeting approaches. This paper has taken a first step in investigating some of the properties of nominal income expectations data from the Michigan Survey and their implications for monetary policy. Consumer expectations of nominal income differ from those of professional forecasters and those in the Greenbook in important ways. In particular, if the Fed had responded to consumer expectations rather than to Greenbook or SPF forecasts in the Great Recession, they might have eased policy more aggressively and waited longer to lift off from the zero lower bound. Consumer expectations also point to a slower path of rate hikes in recent months than would be suggested by professional forecasts.

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APPENDIX A

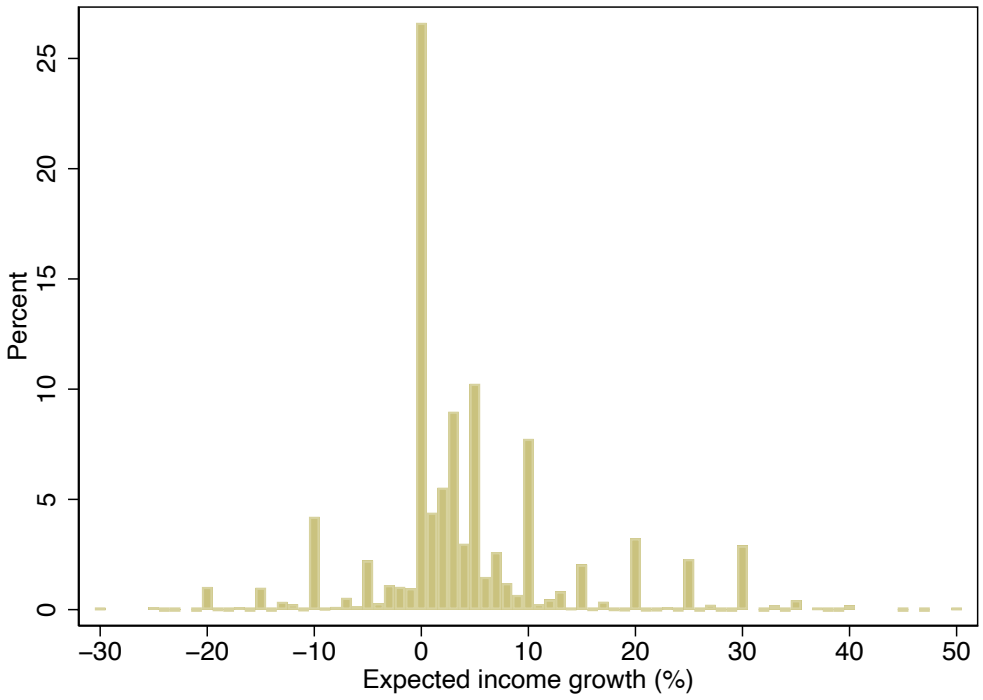
TABLE A.1. Correlations between Consumer Income Expectations Measure and Nominal Income Measures

Variables	Corr. with Current Value	Corr. with One-Year Ahead
NGDP growth	0.58	0.33
Personal income growth	0.58	0.44
Compensation growth	0.56	0.34

Source: Consumer expectations data are from the Michigan Survey of Consumers 1980:Q2 to 2022:Q4.

Note: The table shows the correlation of the income-weighted winsorized measure of nominal income expectations with the current value and the one-year-ahead realization of three measures of income growth: NGDP growth, personal income growth, and compensation growth (FRED series GDP, PI, and A576RC1, where growth is the percent change from the previous year).

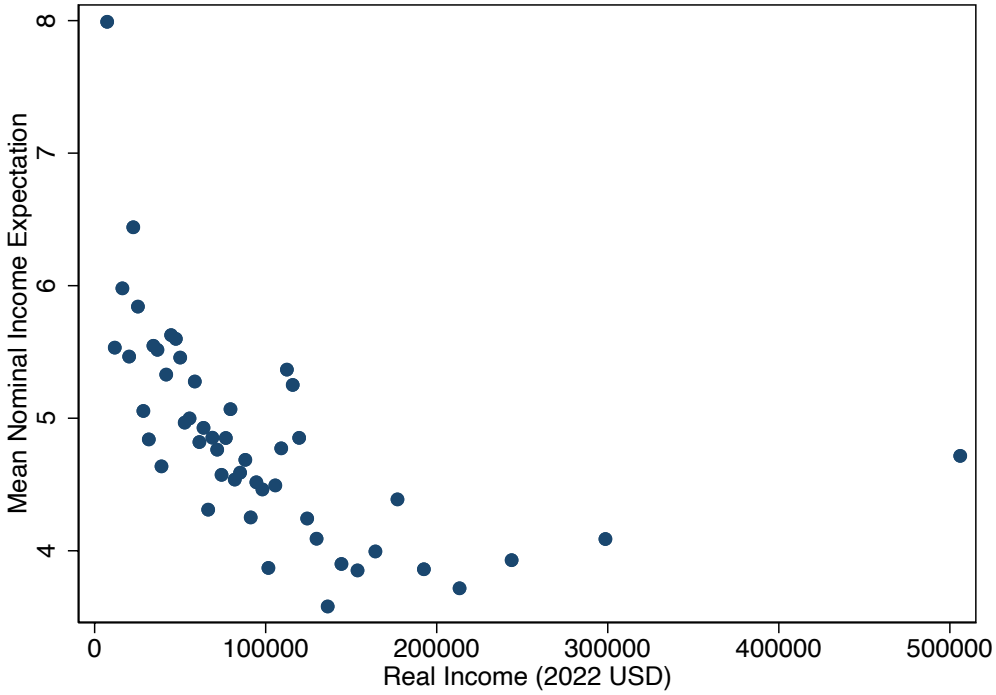
FIGURE A.1. Histogram of Consumer Income Growth Expectations



Source: Data are from the Michigan Survey of Consumers 1980:Q2 to 2022:Q4.

Note: Responses are winsorized at the 5th and 95th percentile by quarter.

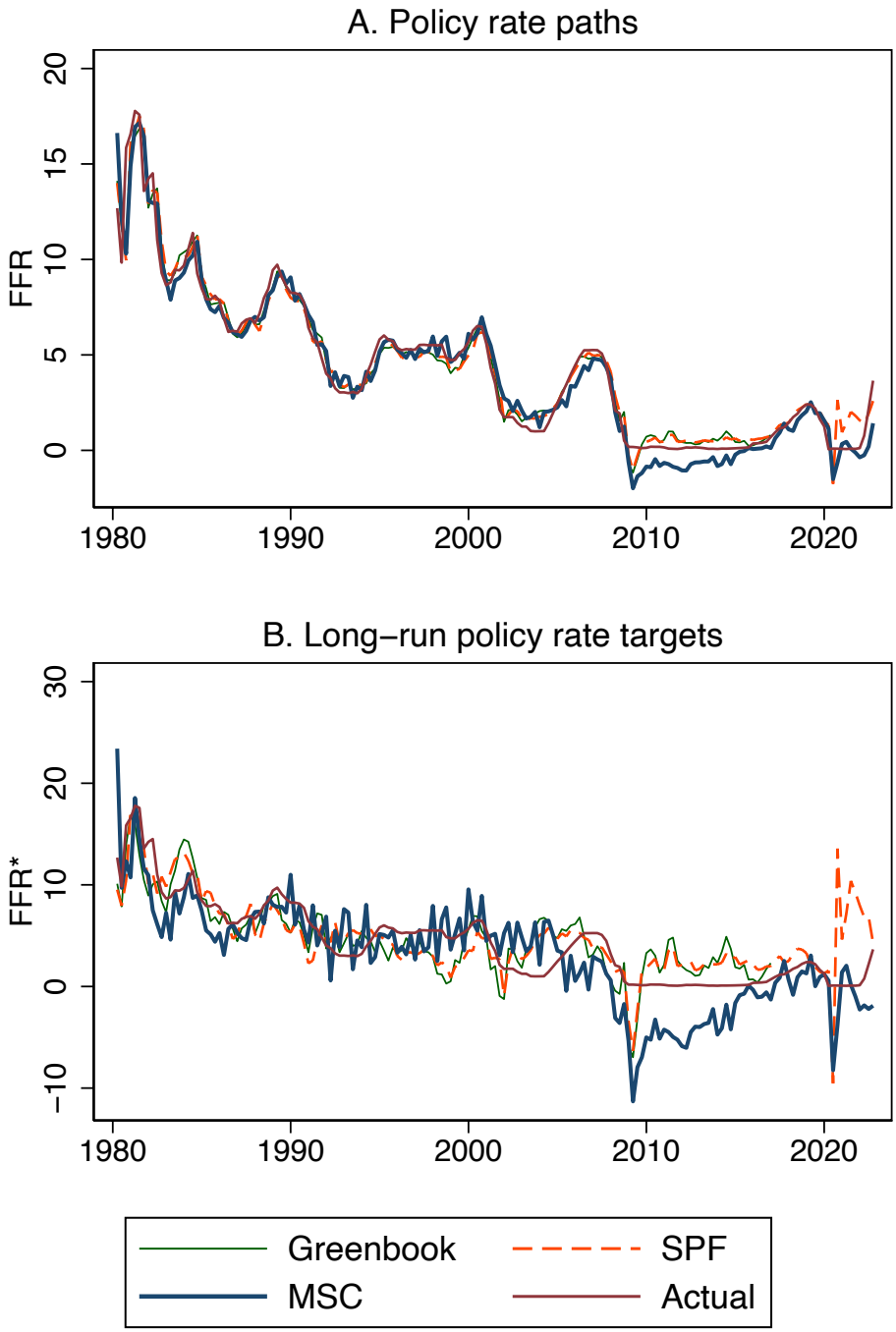
FIGURE A.2. Binscatter Plot of Income Growth Expectations by Real Income



Source: Data are from the Michigan Survey of Consumers 1980:Q2 to 2022:Q4.

Note: Income has been deflated using the Consumer Price Index.

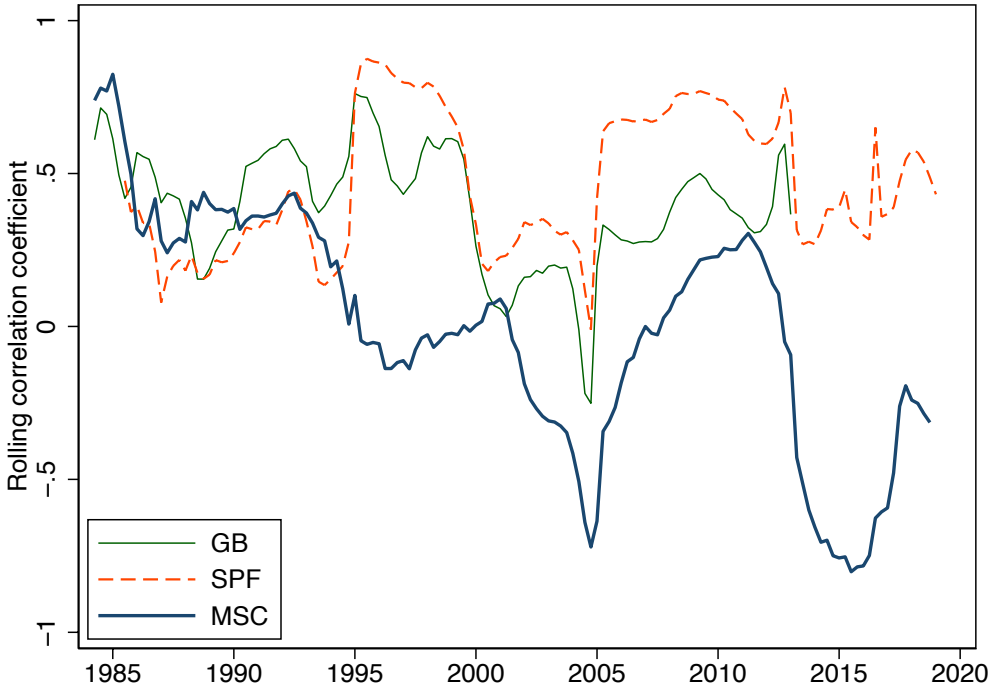
FIGURE A.3. Federal Funds Rate Paths under Alternative Expectations Measures



Source: Data are from the Greenbook, the Survey of Professional Forecasters (SPF), and the Michigan Survey of Consumers (MSC).

Note: The figure shows the actual path of the federal funds rate (FFR) and paths implied by a policy rule as in equation (4), where coefficients are estimated using normalized Greenbook forecast data from 1980:Q2 to 2007:Q4. Coefficient estimates are used to construct fitted values of the federal funds rate path implied by using normalized Greenbook, MSC, and SPF forecasts.

FIGURE A.4. Rolling Correlation between Inflation and Nominal Income Forecasts



Source: Data are from the Greenbook, the Survey of Professional Forecasters (SPF), and the Michigan Survey of Consumers (MSC).

Note: The figure shows the centered 32-quarter rolling correlation between inflation and nominal income forecasts from the Greenbook (GB), SPF, and MSC forecasts. Greenbook inflation forecasts are for one-year-ahead GDP deflator inflation. SPF inflation forecasts are for one-year-ahead Consumer Price Index inflation. MSC inflation forecasts use the series px1_med_all.