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Do Monetary Aggregates Help Forecast Inflation?

The European Central Bank (ECB) and the Federal Reserve share a similar goal, price stability, and their strategies to pursue their goals are similar—with one notable difference. When considering long-term risks to price stability, the ECB places an explicit emphasis on the link between prices and measures of the money supply (also known as monetary aggregates); the Federal Reserve System, in contrast, does not specifically emphasize monetary aggregates.

To explore this difference, the ECB held a conference in November 2006 ("The Role of Money: Money and Monetary Policy in the Twenty-First Century" http://www.ecb.int/events/conferences/html/cbc4.en.html; this site also contains links to the papers discussed below). Fischer et al. showed that including a broad monetary aggregate in the ECB's inflation-forecasting model improved its accuracy. Galí's discussion of that paper argued, however, that the results were somewhat precarious and inconsistent with the more recent experience in the U.S. Furthermore, Woodford argued that most monetary policy goals can be obtained without focusing on the money supply; while he agreed that using monetary aggregates, as the ECB does, can have small advantages, he argued that those advantages come at the cost of losing transparency and accountability in the conduct of monetary policy. Subsequently, this latter point was also made by an OECD report (2007), which concluded, in addition, that monetary aggregates "appear to have lost much of their predictive power in the 2000's, at least so far" (p. 11).

These differences reflect an ongoing debate among economists. While the quantity theory of money (notably Friedman 1987) establishes a direct link between monetary aggregates and the inflation rate, and still dominates introductory economics textbooks, modern macroeconomic theory does not assign money an important role in the conduct of monetary policy.

To shed some light on this debate, this *Economic Letter* investigates one aspect in which monetary aggregates can contribute to monetary policy, specifically, by providing better forecasts of future inflation. Our approach compares the historical predictive value of monetary aggregates in forecasting inflation in the U.S. and in the euro area.

Several disclaimers are worth making at the outset. Our forecasting exercises are not meant to replicate the forecasting models at the ECB or the Federal Reserve. In addition, the forecasting evaluation is done on historical data and contains no predictions about future inflation. Finally, we steer clear of theoretical economic justifications in favor of or against monetary aggregates as these were presented eloquently in several of the ECB conference papers. With these caveats in mind, the predictive evaluation reported here provides compelling evidence that monetary aggregates have negligible predictive power for U.S. inflation, although the evidence is more mixed for the euro area.

The forecasting exercise

Our objective is simple: to evaluate whether forecasts of inflation improve when monetary aggregates are included in a model with well-known predictors of inflation. To forecast inflation, say, six months into the future, we examine how historical observations of inflation correlate with these predictors observed six months prior. If the underlying structure of the economy is the same, the historical average of these correlations will approximately characterize the correlation between the economic variables today and inflation six months hence.

In judging the validity of any statistical test, there are pitfalls to watch for. One is that results showing that the monetary aggregates do improve forecast accuracy may be dubious because it is possible that our model does not include genuinely predictive variables or because our model is too unsophisticated. Either case increases the chances of finding variables that are spuriously good predictors. For example, if we were forecasting the fall harvest of grapes in the Napa Valley, and we omitted winter rainfall but included winter sales of umbrellas, the latter would look like a good predictor. Thus, it would be more definitive to find that monetary aggregates are a poor predictor of inflation than that they improve the accuracy of the forecast.

Another pitfall is that we may include too many variables, in that some will be good predictors simply by chance, making our forecasts more uncertain. For example, consider what happened to Powerball officials in the March 30, 2005, drawing. The chances of getting five out of six numbers correct are about one in three million. Given the number of tickets sold across 29 states, officials expected four or five second place claims but got 110 instead. Why? Because many players had chosen their numbers from fortune cookies that came from the same factory in New York. While the fortune cookie numbers happened to be good "predictors" of the winning combination once, they are unlikely to be so again.

A third issue in evaluating the accuracy of a forecast is its "path dependence." Because current inflation is correlated with past inflation, so are long-run forecasts with short- and medium-run forecasts. Therefore, when comparing the accuracy of different forecasts, one should evaluate their predictive power simultaneously at short, medium, and long horizons. By analogy, we may be quite uncertain whether a train leaving Washington, D.C., is headed for Boston or Miami but it would not make sense to predict that if it is headed for Miami, it will have intermediate stops in Philadelphia and New York. For this reason, we focus on comparing forecast paths (train lines) rather than forecasts at particular horizons (train stations).

With these three features in mind, our interest is out-of-sample predictive ability; that is, our experiments reserve part of the sample for estimation and then use the remaining sample to compare our forecasts with actual core inflation. In the U.S., we save the last three years of data for out-of-sample comparisons; in the euro area, we reserve only the last 18 months because the sample is shorter. We examine forecast paths over the following one, three, six, nine, and twelve months.

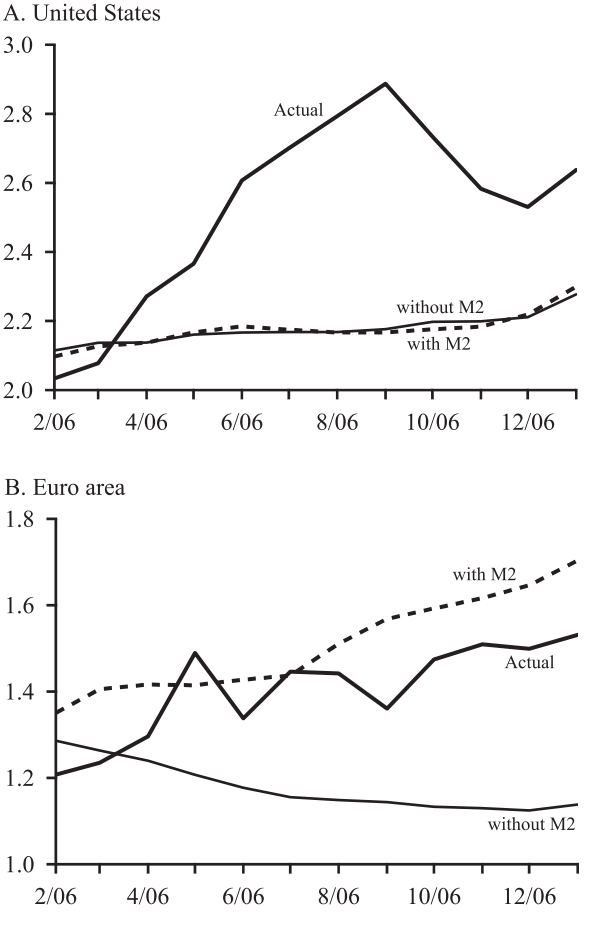
We use the following data: core CPI inflation (excluding food and energy), measures of M2, M3 money stock, and M3C, a corrected version of M3 for the euro area; industrial production in the U.S. and real GDP in the euro area; the federal funds rate for the U.S. and the 4-month Euribor for the euro area. All variables are available monthly, except for the euro area real GDP, which is quarterly. The U.S. sample is January 1985–January 2007 (M3 is available only until February 2006); the euro area sample is January 1997–September 2006 (M3C is available only since January 1999).

Results

We first look at the overall out-of-sample differences between forecasts that include and exclude different measures of monetary aggregates. Therefore, we take the average deviation of the forecasts from actual core inflation over the entire forecast path by adjusting for the correlation of forecasts across horizons (like the correlation of stations in a rail line). Generally, we find that the forecast gains of including monetary aggregates are concentrated toward shorter prediction horizons, six months or less; over nine and twelve months, such forecasts become more imprecise. Meanwhile, whereas the differences in forecasting accuracy for the U.S. are extremely small (usually less than 3%), those for the euro area can be quite large with gains as big as 54% and losses as extreme as 142%.

As an example, Figure 1 illustrates the twelve-month forecasts made by including and excluding M2, and the actual path of inflation between February 2006 and January 2007. For the U.S., the forecasts with and without M2 are very close to each other (although they both miss the run-up in inflation in the middle of the period). For the euro area, the forecasts with and without M2 differ significantly. This forecast is a bit like the "fortune cookie" example: including

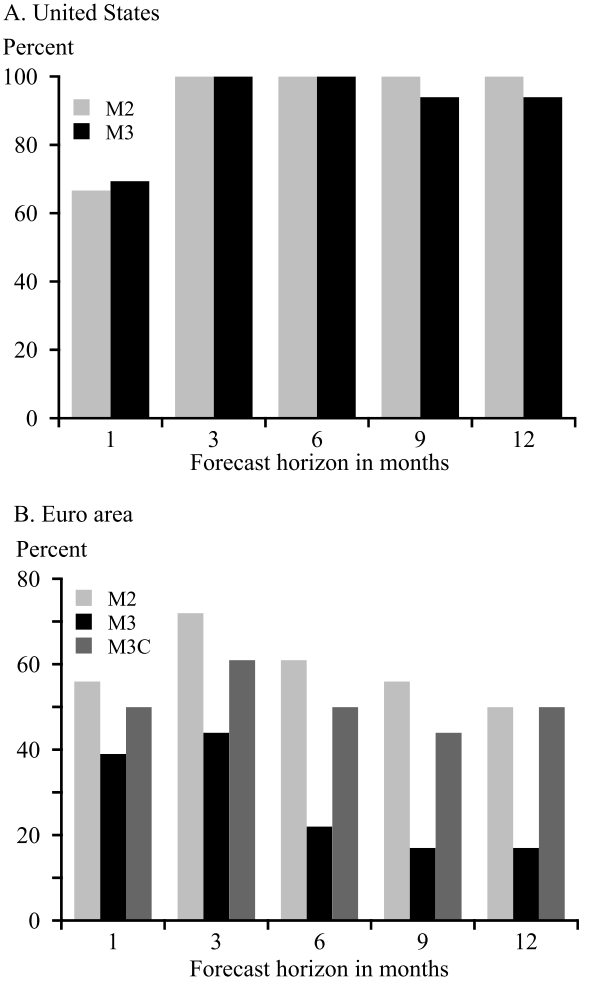
Figure 1
Actual vs. predicted core inflation
(Percent per year)



M2 does seem to result in a more accurate forecast even though on average across all dates in the evaluation sample, including M2 results in a forecasting *loss* for twelve-month-ahead forecasts. These results suggest that monetary aggregates provide, at best, a very small refinement in U.S. inflation forecasts, the picture being considerably murkier for the euro area.

In order to avoid the "fortune cookie" pitfall, therefore, a more formal statistical metric is needed. That is, we must ask: What proportion of out-of-sample forecasts made by excluding monetary aggregates (either M2 or M3) is statistically indistinguishable from forecasts made by including these monetary aggregates in the forecasting model? Figure 2 offers some answers. Not surprisingly, for the U.S., about two-thirds of one-month-ahead forecasts that excluded monetary aggregates and virtually all forecasts at longer horizons are equivalent to forecasts that included monetary aggregates. For the euro area, the proportion of forecasts with significant differences between including and excluding monetary aggregates is higher, especially for the uncorrected measure of M3. However, usually these differences occur because forecasts that include monetary aggregates are less accurate, not more.

Figure 2
Share of cases in which including monetary aggregates does not affect inflation forecast significantly



Conclusions

Our results for the U.S. accord well with Galí's and Woodford's arguments and suggest that there is no predictive power to monetary aggregates when forecasting inflation: whatever information monetary aggregates have seems to be already contained in measures of past inflation, economic activity, and interest rates. Evidence for the euro area is far more ambiguous. Over some horizons (usually in the short run, but not the long run), there appear to be benefits to including monetary aggregates in the forecasting model, although it is probably too early (in terms of the depth of our analysis and the scarcity of data) to tell whether monetary aggregates are the "umbrellas" or the "rainfall" of the euro area's inflation harvest. Overall, our analysis provides little reason to dispute current practices at either central bank.

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