

CREFC ECONOMIC LETTER

Nº. 2002-01, March 20, 2002

Is the U.S. Recession Over Yet?

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Recent data indicate that the U.S. economy is already showing signs of breaking out of the 2001 recession. How and when will we know whether the recession is over?

It seems that the market, economists, and politicians are waiting for a signal from the NBER Business Cycle Dating Committee. The NBER has been dating the U.S. expansions and recessions for the last fifty years. A decision about business cycle turning points is reached from a subjective consensus among the members of the Committee and it is generally accepted as the official dating of the U.S. business cycle.

Although careful deliberations are applied to determine turning points, the NBER procedure can not be used to monitor business cycles on a current basis. Generally, the Committee meets months after a turning point has occurred, and a decision is only released when there is no doubt regarding the dating. This can only be achieved by examining a substantial amount of ex-post revised data. In fact, the NBER has announced in February 2002 that “the Committee will wait until a substantial period of expansion has elapsed before declaring that a turning point in the economy is a true trough, marking the end of a recession” (NBER 2002). Thus, the NBER dating procedure can not be used in real time. This raises some questions:

- How can we assess whether a recession is over until the NBER announces its decision?
- Are there models that can date business cycles in real time?

Formal Probability Models for Dating Recessions

Some analytic models that formalize the construction of economic indicators, and probabilistic frameworks to define and evaluate turning point forecasts have gained popularity in the last decades.

The univariate Markov switching model proposed by Hamilton (1989) reproduces closely

the NBER dating when applied to GDP growth. However, there are some problems in using GDP to assess current economic conditions. First, GDP is only available at the quarterly frequency, which implies a delay in real time chronology. Second, this series undergoes substantial and continuous revisions after its first release, which may compromise a real time assessment of turning points. In fact, the NBER Committee does not put much weight on GDP in their analysis due to these reasons. Instead, the NBER procedure is based on cyclical variation of several monthly variables that move together with business cycles, such as non-agricultural employment, personal income, manufacturing and trade sales, and industrial production, among others.

The univariate Markov switching model can be extended to a multivariate dynamic factor model, as proposed in Diebold and Rudebusch (1995). This framework allows inclusion of several variables reflecting different sectors of the economy.

Chauvet (1998) estimates a dynamic factor model with regime switching (DFMS) including the variables analyzed by the NBER at the monthly frequency. The model yields a monthly indicator of the U.S. business cycle and probabilities of recessions and expansions. These estimated probabilities can be used to obtain dates for the U.S. business cycle. The resulting chronology is highly correlated with the NBER dating ex-post and in real time. Thus, these formal analytic models can be used to monitor turning points and evaluate forecasts in real time, overcoming delays inherent in the NBER dating procedure.

What do nonlinear probability models tell us about U.S. recessions?

Since 1959 the U.S. economy has experienced seven recessions. Figure 1 shows the NBER recession dating (shaded area) and the ex-post probabilities of recessions (smoothed probabilities) obtained from the dynamic factor model with Markov switching (DFMS). These probabilities are

obtained using full sample information (i.e. information available in March 2002).

As observed, the probabilities increase substantially at the beginning of recessions (peaks) and decrease around the end of the recessions (troughs). Recessions are generally short, lasting less than a year on average, whereas expansions are much longer (around 4 years on average). The U.S. expansion of the 1990s was the longest of the last 150 years (10 years).

An interesting feature of the model is that the probabilities of recession also capture the sluggish recovery of the economy after the 1990-1991 recession (the probabilities decrease slowly towards the end of this recession).

Figure 1 - Smoothed Probabilities of Recession from the Dynamic Factor Model with Regime Switching and NBER-Dated Recession

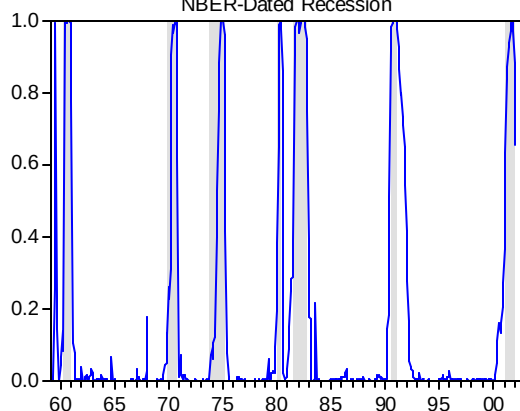
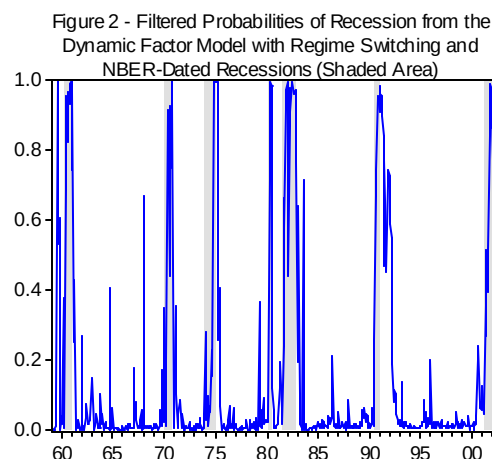


Figure 2 shows the filtered probabilities of recessions, which are obtained using only current information. That is, the probability of a recession in March 2001 is obtained using information available at that month. Thus, it would exclude information about the impact on the economy of the September 11 attack. Since these probabilities use real time information, they also reflect the uncertainty about the economy at each month and, hence, are more volatile. Nevertheless, the estimated filtered probabilities capture all U.S. recessions in real time, including the slow recovery in 1992 and the last 2001 recession.



The 2001 Recession

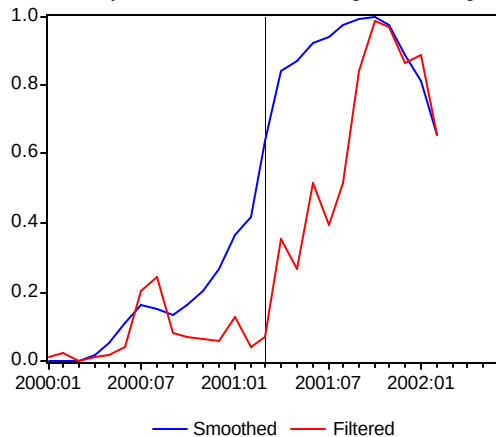
The U.S. economy has been experiencing an economic slowdown since June 2000. Empirical analysis indicates that the manufacturing sector was the most affected sector during this low growth phase. In contrast to slowdowns that can be restricted to a few sectors, recessions are defined as a broad simultaneous decline in several sectors of the economy. In fact, the probabilities of recession from the DFMS model remained quite low in 2000 (between 16% and 20% from June to December 2000).

Table 1 shows the filtered probabilities of recession for the last 14 months. In 2001 these real time probabilities were indicating a low likelihood of recession in the first semester. In particular, the probability of a recession in March 2001 – the peak month called by the NBER – was only 6.8% if only information available at that time is used. The probabilities increase a bit more in the following months, reaching 51.6% in August 2001 – one month before the terrorist attack. This is illustrated in Figure 3, which plots the real time (filtered) and full information (smoothed) probabilities of recession.

Table 1
Probabilities of Recession
Dynamic Factor Model with Regime Switching

Period	Real Time Probabilities of Recession (%)	Full Information Probabilities of Recession (%)
2001 - Jan	12.7	36.5
Feb	4.3	41.5
Mar	6.8	63.4 Peak
Apr	35.3	84.0
May	26.7	86.9
Jun	51.4	92.4
Jul	39.1	93.9
Aug	51.6	97.2
Sept	83.8	99.3
Oct	98.5	99.6
Nov	96.8	97.3
Dec	86.3	88.5
2002 - Jan	88.8	81.2
Feb	65.3	65.3 Trough

Figure 3 - Filtered and Smoothed Probabilities of Recession from the Dynamic Factor Model with Regime Switching



When did the recession start? The role of September 11 in causing or intensifying the recession

In September 2001 the probability of recession jumped to 84% and it remained very high the rest of the year (Table 1).

Thus, the real time probabilities show that although the U.S. economy was performing poorly, this could have been reversed into an expansion had the September 11 attack not occurred.

On the other hand, the full information probabilities of recession, which use information available as of March 2002, give a different picture. Their interpretation is: given that a large negative shock hit the economy in September

2001, and that we now know that this took place, when did the recession actually start? The DFMS model indicates that the NBER Committee was right on target – the probabilities of recession are above 50% exactly in March 2001, as observed in Figure 3.

That is, the model indicates that March 2001 is the beginning of the recession.

Rudebusch (2001) analyzes the monthly series used by the NBER and also finds that the recession peak occurred in March 2001. These same conclusions are also obtained from studying GDP growth. In particular, the univariate Markov switching model indicates that the real time probabilities of recession were low in the first quarter of 2001 (Table 2). These probabilities increased above 50% only in the third quarter of 2001, which includes the month of the terrorist attack. However, the full information probabilities (i.e, using GDP growth through the fourth quarter of 2002) indicate that the recession started in the first quarter of 2001 (57% probability of recession).

Table 2
Probabilities of Recession
Univariate Markov Switching Model

Period	Real Time Probabilities of Recession (%)	Full Information Probabilities of Recession (%)
2001 – Q1	25.6	56.8 Peak
Q2	42.7	71.3
Q3	73.4	77.1
Q4	64.4	64.4
2002 – Q1	NA	NA

GDP data for the first quarter of 2002 will be available in May 2002. A preliminary release will be available in late April .

Note: probability of expansion = 100 - probability of recession.

The important next question: Is the recession over yet?

As of now, March 2002, this is an unresolved question that has been raising a considerable amount of speculation. Knowing whether or not the recession is over has serious implications for economic policy, and economic decisions by firms and individuals. For example, if the state of the economy is known, stock market expectations as summarized by its prices will reflect this possibility of increased future earnings.

In order to answer this question on a current basis, monthly data have to be used. The preliminary quarterly GDP for the first quarter of 2002 will only be released in late May. In addition,

only very preliminary and incomplete monthly data are available as of now, which makes it hard to obtain assessment about the current economic condition. This is when formal probability models may be useful. The dynamic factor model with Markov switching combines several variables and extract whichever common information they have regarding cyclical fluctuations. In addition, it yields real time probabilities of recession.

Table 1 and Figure 4 show what the model is telling us now regarding the recession. The probabilities of recession using information available in March 2002 is 81% in January 2002. This probability drops to 65% in February 2002. Even a very conservative forecast yields probability of recession way below the threshold of 50% in March 2002.

In order to gain insight about turning points, we can examine the relationship between the trough dates assigned by the NBER and the probabilities from the model for the past six recessions. With the exception of the 1990-1991 recession, the NBER trough occurred in the month before the probabilities of recession reached a value below 50%. According to the NBER, a trough is a month in which, at the same time, a recession ends and an expansion starts.

Thus, the model indicates that this last U.S. recession was over in February 2002.

This conclusion is based on current available information on the several coincident economic variables used by the NBER. The model can also be used to forecast a trough using estimated values for the monthly series for March and April 2002. These estimated values were obtained using their sample average and their average in the first couple of months of past economic expansions (an optimistic forecast).

Table 3 shows the forecasted smoothed probabilities using the estimated series. The forecasted probability of recession using estimated values through April 2002 is 54% in January. This probability drops to 18% in February and to only 4% in March 2002.

Hence, using estimated values through April 2002, the model indicates that this last U.S. recession ended in January 2002.

Table 3
Probabilities of Recession from the Dynamic Factor Model with Regime Switching

Period	Full Information Probabilities of Recession (%)
2001 - Jan	29.1
Feb	33.7
Mar	56.6 Peak
Apr	79.5
May	82.7
Jun	89.3
Jul	91.1
Aug	95.7
Sept	98.7
Oct	99.0
Nov	92.9
Dec	71.2
2002 - Jan	53.8 Trough
Feb	18.3
Mar	4.0
Apr	3.3

Note: Shaded Area is the optimistic forecast. The variables used in the DFMS are monthly personal income, employment, sales, and industrial production.

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This Economic Letter appears on an occasional basis and is prepared by the Center for Research on Economic and Financial Cycles (CREFC).