Calling and Timing Recessions

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Abstract. The National Bureau of Economic Research (NBER) is the standard source for determining whether a recession has occurred, and if so, when it started and ended. However, the NBER's method is not algorithmic; it cannot be repeated from publicly available data using known rules. This has flaws or perceived flaws: the NBER's calls are not really comparable over time or with other countries, and the NBER could be accused of bias. This paper presents several "simple" algorithmic methods and compares their results to the NBER's calls. These methods are simple in two ways: only one publicly available data series (e.g., real GDP) is used for any given method, and the algorithms are simple enough for spreadsheet or even manual calculation. As it turns out, simple methods can be found which call exactly the same 11 post-war recessions that the NBER did, with at least 70% of start and end dates within two months of the NBER's dates. One such method uses real GDP, and another uses non-farm payrolls. In each case, a recession is called if the level decreases more than a percentage threshold in a one-year period.

1. Introduction. While there is no official arbiter of determining when recessions occurred, when they started and when they ended, the National Bureau of Economic Research (NBER) has become the defacto arbiter of such calls for the U.S. economy. The NBER uses a panel of seven economic experts to make what is essentially a subjective call. While the dating committee of the NBER uses multiple quantitative inputs, the process is not algorithmic – it cannot be repeated from available data using known rules.

While a common data base of recession dates is useful for many purposes, the subjective and non-deterministic nature of the NBER's calls suffers in other respects.

- The criteria for calling a recession's beginning and end might not be consistent with each other. For example, the beginning time might be weighted more on jobs data, but the ending weighted more on GDP data, or vice versa.
- The criteria might not be consistent across multiple recessions. Why does one recession start when jobs data peaks, but another starts when GDP peaks?
- The criteria are not consistent with recessions in other countries. The NBER does not make similar recession calls for non-U.S. countries. How do we compare recessions in the U.S. with those in other countries. Which one started first?
- The NBER could be suspected of political bias. The NBER's dating committee is made up of members who often cycle into and out of high level positions in government administrations such as Chief of the Council of Economic Advisors.

This paper analyzes alternate methods of calling recessions and timing their beginnings and ends. However, the methods analyzed here are restricted to those that are "simple" and repeatable by the public. For example, if we *do* use the simple "two quarters" rule in calling recessions, how would that compare to NBER calls?

Below, we describe some alternate methods, show their results, and compare them to NBER results. As it turns out, simple methods do exist that call exactly the same post-war recessions that the NBER did, with generally similar timings on peaks and troughs.

2. Alternative Methods. This paper explores multiple ways of calling and timing recessions. All such methods have two general features in common: (1) use of only a single data series widely available to the public, and (2) "simple" algorithms that could be calculated in a standard spreadsheet or even manually.

The three data series used in this analysis were real GDP, non-farm payrolls and industrial production. (See data sources, below.)

2.1 Definitions and Criteria. To describe the algorithms, a definition of some terms is necessary.

Trigger. The "trigger" period is the earliest time period (month or quarter) in which the criteria for calling a recession are met. These criteria will be described below.

Peak. The "peak" is the maximum value in the data series prior to the trigger period.

Recovery. The "recovery" period is the first period after the peak period in which the value in the data series exceeds the peak value.

Trough. The "trough" period is the minimum value in the data series between peak and recovery.

The peak and trough periods correspond to the beginning and end of the recession. With the above definitions, the timing of a recession, once called or triggered, is unambiguous and repeatable. Any person or computer algorithm using the same data series would identify the same peak and the same trough.

This paper also explores several methods for defining a trigger period.

Two-Quarter Rule. This is the simple rule-of-thumb that a recession begins with two consecutive quarters of decline in real GDP. The trigger period is the first such quarter. This rule will only be applied to the GDP data series.

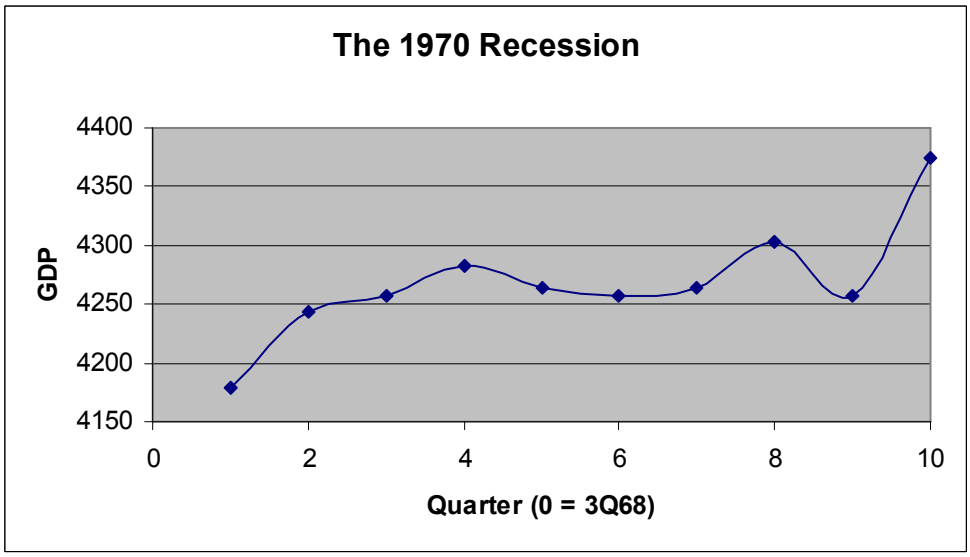
Depth Rule. The trigger period for this rule is the first period in which the data is X% below the previous maximum value. We will explore various X thresholds.

Breadth and Depth Rule. A potential trigger is any period with a lower data value than the previous maximum value. For such a period, the peak and recovery periods are identified. If the time between peak and recovery is long enough (extent threshold) and some point in that peak-to-recovery period meets the depth threshold, then a recession is called.

One Year Rule. Using this rule, a recession is called if, in a given period (month or quarter), the data value is X% below the corresponding data value exactly one year prior. The earliest such period is then the trigger period.

In all the above definitions, the "previous maximum" value is the all-time maximum value in the data series prior to that period.

2.2 The 1970 Recession. While the above methods might seem rather simple and intuitive, the 1970 recession is an example of how complicated things can become. Below is the graph of real GDP in the 1968-1971 period. (In this graph, the data points are quarterly real GDP values as provided by government sources. The curve is simply the Excel spline curve to help visualization, and should not be taken as the "true" GDP between data points.)



Over this period there are two mini-peaks and two mini-troughs. While the peak at Q8 is clearly above the Q4 peak, the troughs at Q6 and Q9 are exactly equal (to within the precision of the referenced data base).

Is this one big recession, peaking at Q4 and troughing at Q9? Or is it a shorter recession troughing at Q6? Or is it an even shorter recession peaking at Q8 and troughing at Q9? Or is it not a recession at all?

In fact, the NBER said this recession peaked at Q5 and troughed at Q9 (or 4Q1969 to 4Q1970). But again, the NBER does not base its calls solely, or always even predominantly, on GDP.

By the "simple" definitions above, this could not be one long recession, since Q8 is above Q4. That is, any recession starting at Q4 experiences recovery by Q8.

Two-Quarter Rule. By this rule, a trigger period is Q5, so a recession is called then, with associated peak at Q4 and trough at Q6. There are no two consecutive quarters after Q8 (before the next "recovery"), so no recession is called for that later trough. This rule says one recession, starting at Q4 and ending at Q6.

The Depth Rule. The real GDP at Q6 is 0.63% below the Q4 GDP, but Q9 is 1.06% below Q8. So any threshold above -0.63% would say there are two recessions; any threshold between -0.63% and -1.06% would say there is only one (the later one); and any threshold below -1.06% would say no recession occurred.

The Breadth and Depth Rule. Given the threshold on depth is above minus 0.63%, the calling of a recession by this rule depends on the breadth threshold. If the threshold for peak to recovery period is more than two periods, then no recession would be called for the Q9 trough. But if the threshold is less than four periods, then there would be a recession call for the Q6 trough.

The One Year Rule. If we put our one-year threshold simply at 0% (a net decline in real GDP over any one year period), then the only trigger period in this time frame is Q9. So this rule gives only one recession, with peak at Q8 and trough at Q9.

So the simple rules described above, depending on thresholds, could yield any of the following results for the 1970 recession.

- No recession.
- One recession starting at Q4 and ending at Q6.
- One recession starting at Q8 and ending at Q9.
- Two recessions, with the above peaks and troughs.

Ironically, the only result that could not follow from these rules is one long recession that includes both troughs, which is exactly what the NBER called.

It might be tempting to invent other rules, such as, "do not declare a recovery if the recovery period is immediately followed by a downturn of some extent." Such rules would become increasingly complicated and likely yield counterintuitive results when applied across an entire data series. In this paper, we stick with the above "simple" rules.

2.3 Thresholds. While the methods above are simple enough, results can vary significantly depending on the thresholds used. Various thresholds for the various methods and data series were examined in order to determine reasonable thresholds.

"Reasonable" was defined as at least approximating the NBER results in terms of calling recessions.

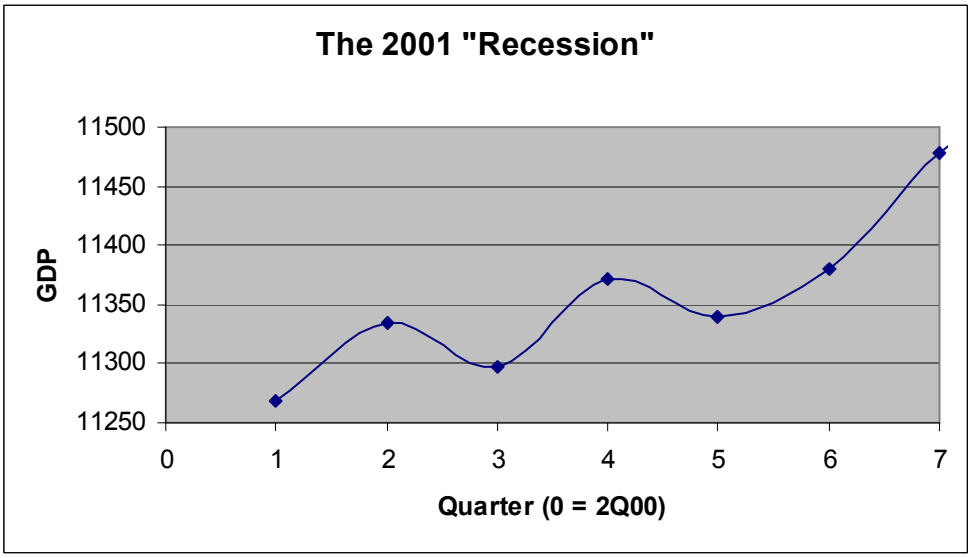
2.3.1 Depth Rule, GDP Series. The 2001 recession called by the NBER presents a challenge for this case. A conservative enough threshold (below -1.06%) can be found so that all recessions since 1946 match the NBER calls except for the 2001 recession. However, any threshold high enough to call the 2001 recession also calls a recession in

1956 that the NBER did *not* call (any threshold above -0.45%). Additionally, it would treat the 1970, 1974 and 1980 recessions as two separate recessions each.

For these reasons, the threshold was set at -1%. This threshold exactly matches all post-1946 recession calls of the NBER except for the 2001 recession.

2.3.2 Breadth-Depth Rule, GDP Series. The 2001 recession presented the same challenge for this method. Relaxing the depth threshold but including a breadth threshold did not help with declaring the 2001 recession without declaring multiple other recessions not called by the NBER.

The 2001 "recession", in terms of real GDP, was only two non-consecutive quarters of negative growth, depicted in the graph below. In this graph, Q4 is above Q2, and Q6 is above Q4. So if recessions are called here, they would be two separate ones lasting only one quarter from peak to trough. Additionally, the first trough is just 0.33% below its previous peak and the second trough is only 0.27% below its previous peak, or not very deep.



As a result, the same depth threshold was used for both the depth-only and the breadth-depth methods, with no restriction on breadth in the breadth-depth method. In effect, these methods yield the same recession calls for real GDP data, calling all the same recessions as the NBER, with the exception of the 2001 recession.

2.3.3. One-Year Rule, GDP Series. A threshold of zero in this case means that any time the real GDP in a given quarter is less than the GDP four quarters prior, a recession is called. With a threshold of zero, this method calls all the same recessions as the NBER, except the 2001 recession.

However, a threshold between positive 0.402% and 0.761% would call the 2001 recession without calling any "extra", or non-NBER called, recessions. While such a threshold seems arbitrary, a threshold of positive 0.5% was used to obtain results.

In the results below, the One-Year Rule was used with two different thresholds: 0% and +0.5%.

2.3.4 Depth Rule, Payroll Series. A depth threshold can be found to call the same recessions that the NBER did. However, results are very sensitive to this threshold. A threshold depth of -1.20% would match the NBER. But a threshold of -1.28% would miss the 1980 recession. On the other hand, a threshold of -1.19% would call a recession in 1956. A threshold of -1.2% was used to obtain results.

2.3.5 Breadth-Depth Rule, Payroll Series. By adding a breadth, or time extent, criterion as well as depth, the depth threshold could be relaxed to 0%, and any extent (peak period to recovery period) of at least five months and less than 10 months would match NBER recession calls. Thresholds used to obtain results were 0% on depth and six months on breadth.

2.3.4 One-Year Rule, Payroll Series. This case matched the NBER calls exactly with the simple threshold of 0%. A threshold below -0.42% would miss the 1980 recession, while one above 0.17% would call a recession in 1952, separate from the 1953 recession.

2.3.5 One-Year Rule, Industrial Production Series. The One-Year Rule was the only method attempted using the Industrial Production index. The threshold used was -2%.

2.3.6 Summary of Methods and Thresholds. A total of eight alternative methods were used as the overall evaluation set to compare against NBER calls.

- Two-Quarter Rule with GDP. Threshold of zero implied.
- Depth Rule with GDP. Threshold of -1%, a somewhat sensitive threshold (-1.06 to -0.45%). (Breadth-depth rule not used on GDP data, since it would yield same results as the depth-only rule.)
- One-Year Rule with GDP. Threshold of 0%.
- One-Year Rule with GDP. Threshold of +0.5%, a somewhat sensitive threshold (setting it below 0.4% would miss the 2001 recession, and setting above 0.76% would call a recession in 1956 that the NBER did not call).
- Depth Rule with Payroll. Threshold of -1.2%, a very sensitive threshold (-1.28 to -1.19%).
- Breadth-Depth Rule with Payroll. Threshold of 0% on depth and six months on breadth (sensitivity range: 5 to 10 months).
- One-Year Rule with Payroll. Threshold of 0% (-0.42 to +0.17%).
- One-Year Rule with Industrial Production. Threshold of -2%. A threshold lower than -3.61% would miss the 1990 recession called by the NBER, but a threshold above -1.56% would call a recession in 1956 that the NBER did not call.

3. Results. The eight alternative methods, their recession calls, and their timing calls are compared to NBER calls. The GDP, payroll and production results are first shown separately.

3.1 GDP Based Methods. The trigger periods are shown first, since the timing calls are derived from trigger periods.

GDP Based Alternative Methods, Trigger Periods

Year	NBER	2-Quarter	Depth	1-Year, 0%	1-Year, 0.5%
1947	No Call	2Q47*	No Call*	N/A	N/A
1948	4Q48 – 4Q49	1Q49	1Q49	2Q49	2Q49
1953	3Q53 – 2Q54	3Q53	4Q53	1Q54	4Q53
1957	3Q57 – 1Q58	4Q57	4Q57	1Q58	4Q57
1960	2Q60 – 1Q61	No Call	4Q60	1Q61	1Q61
1970	4Q69 – 4Q70	4Q69	4Q70	4Q70	1Q70
1974	4Q73 – 1Q75	3Q74	3Q74	2Q74	2Q74
1980	1Q80 – 3Q80	2Q80	2Q80	2Q80	2Q80
1982	3Q81 – 4Q82	4Q81	4Q81	1Q82	1Q82
1990	3Q90 – 1Q91	3Q90	1Q91	1Q91	1Q91
2001	1Q01 – 4Q01	No Call	No Call	No Call	4Q01
2008	4Q07 – 2Q09**	3Q08	4Q08	4Q08	3Q08

* Ambiguous start date since data series begins with 1Q47.
** Anticipated. NBER has not yet made this call.

GDP Based Alternative Methods ("Odd" calls highlighted)

Year	NBER	2-Quarter	Depth	1-Year, 0%	1-Year, 0.5%
1947	No Call	**1Q47*-3Q47**	No Call*	N/A	N/A
1948	4Q48 – 4Q49	4Q48-2Q49	4Q48-2Q49	4Q48-2Q49	4Q48-2Q49
1953	3Q53 – 2Q54	2Q53-1Q54	2Q53-1Q54	2Q53-1Q54	2Q53-1Q54
1957	3Q57 – 1Q58	3Q57-1Q58	3Q57-1Q58	3Q57-1Q58	3Q57-1Q58
1960	2Q60 – 1Q61	**No Call**	1Q60-4Q60	1Q60-4Q60	1Q60-4Q60
1970	4Q69 – 4Q70	**3Q69-1Q70**	3Q70-4Q70	3Q70-4Q70	**3Q69-1Q70**
1974	4Q73 – 1Q75	4Q73-1Q75	4Q73-1Q75	4Q73-1Q75	4Q73-1Q75
1980	1Q80 – 3Q80	1Q80-3Q80	1Q80-3Q80	1Q80-3Q80	1Q80-3Q80
1982	3Q81 – 4Q82	3Q81-1Q82	3Q81-1Q82	3Q81-1Q82	3Q81-1Q82
1990	3Q90 – 1Q91	2Q90-1Q91	2Q90-1Q91	2Q90-1Q91	2Q90-1Q91
2001	1Q01 – 4Q01	No Call	No Call	No Call	**2Q01-3Q01**
2008	4Q07 – 2Q09**	2Q08-2Q09	2Q08-2Q09	2Q08-2Q09	2Q08-2Q09

* Ambiguous start date since data series begins with 1Q47.
** Anticipated. NBER has not yet made this call.

The Two-Quarter rule misses two NBER recession calls (1960 and 2001) and calls a recession in 1947 that the NBER did not call. Other methods also miss the 2001 recession, with the exception of the One-Year Rule with a positive 0.5% threshold.

Also, the rule-based recessions have the same timing calls as each other, except the 1970 recession. As discussed above, this "double-dip" recession can be timed on either dip, depending on the rule.

The table below shows how timing the peaks and troughs differ from the NBER, using the One-Year Rule and +0.5% threshold to represent rule-based methods for GDP. Positive values mean the rule-based method timed the peak or trough *after* the NBER's timing, or the duration *longer* than the NBER's.

Timing Differences (Quarter)
One-Year Rule Using GDP (+0.5% Threshold) vs. NBER

Year	NBER	Peak	Trough	Duration
1948	4Q48 – 4Q49	0	-2	-2
1953	3Q53 – 2Q54	-1	-1	0
1957	3Q57 – 1Q58	0	0	0
1960	2Q60 – 1Q61	-1	-1	0
1970	4Q69 – 4Q70	-1	-3	-2
1974	4Q73 – 1Q75	0	0	0
1980	1Q80 – 3Q80	0	0	0
1982	3Q81 – 4Q82	0	-3	-3
1990	3Q90 – 1Q91	-1	0	+1
2001	1Q01 – 4Q01	+1	-1	-2
2008	4Q07 – 2Q09*	+2	0*	-2*

* Preliminary call

A simple way to time recessions with more (arbitrary) precision, i.e., to the month, is to use the final month of the quarter for the GDP method. The results for the One-Year Rule (with +0.5% threshold) are shown below.

Timing Differences (Month, outliers highlighted)
One-Year Rule Using GDP, +0.5% Threshold vs. NBER

Year	NBER	1-Year (0.5%)	Peak Diff.	Trough Diff.	Duration Diff.
1948	11/48 – 10/49	12/48-6/49	+1	-4	-5
1953	7/53 – 5/54	6/53-3/54	-1	-2	-1
1957	8/57 – 4/58	9/57-3/58	+1	-1	-2
1960	4/60 – 2/61	3/60-12/60	-1	-2	-1
1970	12/69 – 11/70	9/69-3/70	-3	**-8**	-5
1974	11/73 – 3/75	12/73-3/75	+1	0	-1
1980	1/80 – 7/80	3/80-9/80	+2	+2	0
1982	7/81 – 11/82	9/81-3/82	+2	**-8**	**-10**
1990	7/90 – 3/91	6/90-3/91	-1	0	+1
2001	3/01 – 11/01	6/01-9/01	+3	-2	-5
2008	12/07 – 6/09*	6/08-6/09	**+6**	0*	**-6***

* Anticipated. NBER has not yet made this call.

With this method, the comparison with NBER calls is fairly impressive. Of the 21 peaks and troughs, 9 (43%) were called within one month of the NBER's call, and 15 (71%) within two months. Three peak or trough calls differed from the NBER's calls by more than four months. The only such call on a peak was the most recent recession, the 2008 recession. In this case, the NBER knowingly based its peak timing on factors other than GDP. Real GDP was higher in 2Q08 (six months into the recession per the NBER) than in 4Q07.

Two trough calls differed from the NBER's call by eight months: 1970 and 1982. The 1970 recession was a "double-dip" one and problematic by its nature, discussed above. The 1982 recession was a case in which GDP started growing, very slowly and hesitantly, before jobs and other economic measures picked up. While the true low point in real GDP occurred in 1Q82, the 3Q82 and 4Q82 numbers were only slightly better: 0.15% and 0.23% above the 1Q82 trough. The NBER went with that later quarter, 4Q82 – an eight month difference in timing, but only a 0.23% difference in GDP.

3.2 Payroll Based Methods. Trigger periods for the payroll methods are shown below.

Payroll Based Alternative Methods, Trigger Periods

Year	NBER	Depth	Breadth-Depth	One-Year
1945	2/45-10/45	3/44	12/43	3/44
1948	11/48 – 10/49	1/49	10/48	1/49
1953	7/53 – 5/54	11/53	8/53	12/53
1957	8/57 – 4/58	11/57	5/57	10/57
1960	4/60 – 2/61	10/60	5/60	12/60
1970	12/69 – 11/70	10/70	4/70	8/70
1974	11/73 – 3/75	12/74	8/74	12/74
1980	1/80 – 7/80	7/80	4/80	6/80
1982	7/81 – 11/82	3/82	8/81	12/81
1990	7/90 – 3/91	4/91	7/90	1/91
2001	3/01 – 11/01	11/01	3/01	7/01
2008	12/07 – 6/09*	10/08	1/08	5/08

* Anticipated. NBER has not yet made this call.

All payroll methods called the same recessions as the NBER. Also, all payroll-based rule methods, with the thresholds described above, called peaks and troughs at the exact same time as each other (but not as the NBER). Differences with NBER are shown below.

Timing Differences (Months, outliers highlighted)
Any Payroll Rule vs. NBER

Year	NBER	Payroll	Peak	Trough	Duration
1945	2/45-10/45	11/43-9/45	**-15**	-1	+14
1948	11/48 – 10/49	9/48 – 10/49	-2	0	+2
1953	7/53 – 5/54	7/53 – 8/54	0	+3	+3
1957	8/57 – 4/58	4/57 – 6/58	-4	+2	+6
1960	4/60 – 2/61	4/60 – 2/61	0	0	0
1970	12/69 – 11/70	3/70 – 11/70	+3	0	-3
1974	11/73 – 3/75	7/74 – 4/75	**+8**	+1	-7
1980	1/80 – 7/80	3/80 – 7/80	+2	0	-2
1982	7/81 – 11/82	7/81 – 12/82	0	+1	+1
1990	7/90 – 3/91	6/90 – 5/91	-1	+2	+3
2001	3/01 – 11/01	2/01 – 8/03	-1	**+21**	+22
2008	12/07 – 6/09*	12/07 – ?	0	$\geq$ +3	$\geq$ +3

* Anticipated. NBER has not yet made this call.

Most timing calls are similar between the payroll methods and NBER, with some striking exceptions, namely the 1945 and 2001 recessions. The rule-based method put the peak of the 1945 recession in November 1943, or the middle of World War II. The huge war effort at that time made this an anomalous period: a drawdown in employment, without a corresponding slide in GDP.

Of the 21 post-war peaks and troughs, the payroll method called 12 (57%) within one month of the NBER's call, 16 (76%) within two months, and 18 (86%) within three months. Only two post-war peaks or troughs differed by more than four months: the 1974 peak and the 2001 trough.

The 2001 recession trough was more problematic. In terms of real GDP, the 2001 "recession" was hardly a recession at all. No two consecutive quarters of negative growth. No one-year negative growth. And maximum decline of just 0.33% of GDP, with a recovery one-quarter later. However, payrolls declined for 30 months, reaching declines of over 2% from pre-recession peak.

The 2001 recession appears to be anomalous compared to the other post-war recessions in that GDP and jobs did quite move together.

It is still possible that the 2008 recession could be another such "jobless recovery", but with a steeper decline in payrolls.

3.3. Industrial Production Method. Only the One-Year Rule (-2% threshold) was used with this data series, results below. (Sensitivity range of -3.61 to -1.56%.)

Industrial Production Based Alternative Method (Outliers highlighted)

Year	NBER	Ind. Prod.	Peak Diff.	Trough Diff.
1920	1/20-7/21	2/20-4/21	+1	-3
1924	5/23-7/24	5/23-7/24	0	0
1927	10/26-11/27	3/27-11/27	+5	0
1930	8/29-3/33	7/29-7/32	-1	**-8**
1937	5/37-6/38	5/37-5/38	0	-1
1945	2/45-10/45	2/44-2/46	**-12**	+4
1948	11/48 – 10/49	Part of 1945	N/A	N/A
1953	7/53 – 5/54	7/53-4/54	0	-1
1957	8/57 – 4/58	2/57-4/58	**-6**	0
1960	4/60 – 2/61	1/60-2/61	-3	0
1970	12/69 – 11/70	8/69-11/70	-4	0
1974	11/73 – 3/75	11/73-5/75	0	+2
1980	1/80 – 7/80	2/80-12/82	+1	N/A
1982	7/81 – 11/82	Part of 1980	N/A	+1
1990	7/90 – 3/91	9/90-3/91	+2	0
2001	3/01 – 11/01	9/00-12/01	**-6**	+1
2008	12/07 – 6/09*	12/07-6/09?	0	0*

* Anticipated. NBER has not yet made this call.

This method said the 1948 and 1982 recessions that the NBER called were actually part of previous recessions or their recovery periods. With those exceptions, this method called all the same recessions since 1920 that the NBER did.

The 1948 recession, per Industrial Production, was part of the long recovery from a 1945 recession that started in February 1944 and troughed in February 1946. Also, the 1982 recession was part of one long recession that started in February 1980 and ended in December 1982.

With such exceptions, the timing calls using Industrial Production were very similar to NBER calls. With few exceptions, the peaks and troughs were called within 4 months of the NBER's calls. The exceptions are noted here.

- 1930. Industrial production reached a trough eight months earlier than the NBER called it: July 1932 instead of March 1933.
- 1945. Industrial production peaked one full year before the NBER called it. However, this was the end of World War II, and therefore historically anomalous.
- 1957 and 2001. In both these cases, industrial production peaked six months before the NBER's recession start.

Going by industrial production, two recessions actually started in different political administrations than the NBER's call. The 1982 recession, rather than starting under President Reagan, was a continuation of the 1980 recession that started under President Carter. Also, the 2001 recession started under President Clinton, not President Bush, per industrial production. Also per this method, the 1930 recession ended in 1932 under Hoover, rather than in 1933 under Roosevelt.

3.4. The One-Year Methods, Summary. A summary of the post-war recessions, as called by the GDP, payroll and industrial productions One-Year methods, is provided in the chart below. (The GDP One-Year method had the +0.5% thresholds, with dating calls being the last month of the peak or trough quarter.)

GDP	Dur.	Depth	Payroll	Dur.	Depth	Ind. Prod.	Dur.	Depth
12/48-6/49	6	-1.75%	9/48-10/49	13	-5.18%	*	*	*
6/53-3/54	9	-2.65	7/53-8/54	13	-3.39	7/53-4/54	9	-9.51%
9/57-3/58	6	-3.73	4/57-6/58	14	-4.37	2/57-4/58	14	-13.58
3/60-12/60	9	-1.58	4/60-2/61	10	-2.29	1/60-2/61	13	-8.56
9/69-3/70	6	-1.06	3/70-11/70	8	-1.46	8/69-11/70	15	-6.98
12/73-3/75	15	-3.19	7/74-4/75	9	-2.76	11/73-5/75	18	-13.02
3/80-9/80	6	-2.23	3/80-7/80	4	-1.27	2/80-12/82	22	-9.73
9/81-3/82	6	-2.87	7/81-12/82	17	-3.10	**	**	**
6/90-3/91	9	-1.36	6/90-5/91	11	-1.48	9/90-3/91	6	-4.17
6/01-9/01	3	-0.33	2/01-8/03	30	-2.04	9/00-12/01	15	-6.11
6/08-6/09	12	-3.83	12/07-?	$\geq$ 22	$\leq$ -5.22	12/07-6/09?	18	-14.78

* Considered recovery portion of the 1945 recession.
** Considered part of recession that started in 1980.

Generally, both the "jobs recession" and the "production recession" last longer than the "GDP recession." The jobs/GDP disparity is most starkly apparent in the 2001 recession. While the 2001 "economic recession" was hardly a recession at all, its associated "jobs recession" was the longest post-war, with job losses deeper than in three other recessions: 1970, 1980 and 1990.

The 2008 recession was severe on all counts. It was the deepest post-war recession in all three measures: GDP, jobs and production. Its peak-to-trough GDP duration was longer than all post-war recessions except the 1973-75 recession. It's peak-to-trough jobs duration was longer than all but the 2001 recession, with payrolls still declining at the time of this writing. Its peak-to-trough production duration was as long or longer than all but the 1980-82 recession, if counted as two recessions. And those duration figures assume the 2008 recession is over.

4. Conclusions. Perhaps surprisingly, very simple algorithms, using only single data streams that are easily available to the public, call all the same post-war recessions that the NBER did, without false alarms. The two simplest such methods are as follows:

- If the real GDP does not grow at least 0.5% over one full year (four quarters), then a recession has occurred in that year. (It's possible it could already be over by that time.)
- If the number of jobs (non-farm payrolls) declines over one full year (12 months), then a recession has occurred in that year.

The ways to date recession peaks and troughs using these methods are as follow: the peak is the highest point in the data series prior to the trigger period, the recovery period

is the first one in the series after the peak that is higher than the peak, and the trough is the minimum point between peak and recovery. These methods, both calling recessions and timing them, could be done with simple spreadsheet functions or even manually.

While these methods call the same recessions as the NBER, they do not time their beginnings (peaks) and endings (troughs) exactly the same.

Although similar in timing calls in most cases, the GDP method could differ from the NBER call by up to six months for the peak, eight months for the trough and ten months for duration. But these larger differences were confined to three of the eleven post-war recessions. The majority of timing calls were within two months of the NBER calls.

The payroll method generally matched NBER's peaks and troughs as well, but with significant exceptions. In 10 of 12 recessions, the peak was within 4 months of the NBER's peak. In one other case, the peak was eight months different from the NBER call. In 10 of 11 recessions, the trough was within three months of the NBER trough. (The trough of the 2008 recession is not yet determined.) The majority of timing calls were within one month of the NBER calls.

However, the single exceptions in each case (peak of the 1945 recession and trough of the 2001 recession) were significantly different from the NBER's calls. The 1945 recession was associated with World War II, an economically anomalous time. But the 2001 recession was more alarming, with jobs declining for 30 months despite a growing GDP most of that time.

If a similar "jobless recovery" pattern holds for the 2008 recession as well, it could spell trouble on the employment front in 2010 and even 2011. In the 2001 recession, jobs declined for almost two years after GDP started growing.

The discrepancies in timing calls really amount to what is meant by "recession", since GDP, jobs, industrial production and other economic measures do not always move together. Discrepancies among economic measures are what underlie differences in timing recessions.

An obvious question is whether the NBER is "right." All simple methods relied on a threshold, and whether or not a recession was called depended on the threshold. Minor changes in thresholds, usually only a one-percentage point either way, would either miss recessions that the NBER called, or call recessions that the NBER did not.

Several recessions or near-recessions pose problems:

- The 2001 recession was not a "real" recession according to many rules using real GDP. No two consecutive quarters of real growth. No negative real growth over any one-year period. Maximum real GDP shrinkage of only 0.33% and full recovery only two quarters after peak. And if a recession is called for 2001, the industrial production series indicates it started in 2000 (under Clinton) rather than 2001 (under Bush).

- The 1980 recession could be considered too shallow in terms of job losses to be a real recession. On the other hand, there is good reason (e.g., industrial production) to believe that the 1980 and 1982 recessions are really part of one longer recession – one that started under President Carter and only ended under President Reagan.
- The years 1952 or 1956 could be considered recession years by some measures, yet the NBER did not call a recession in either year.

In essence, whether or not we call any given "slump" a recession is arbitrary, as are the calls on when a recession begins and ends.

5. Recommendation. For consistency, transparency and objectivity, the author recommends a simple rule (especially when comparing the US economy to that of other countries): if GDP declines over any one-year period, a recession occurred, with its beginning and ending marked by the associated peak and trough quarters associated with that decline, and using the last month of the associated quarter for more precise timing.

The following chart shows how that method differs from the NBER for post-war recessions.

Recommended Method vs NBER (month)

Year	NBER	1-Year, 0%	Peak Diff.	Trough Diff.	Dur. Diff.
1948	11/48 – 10/49	12/48-6/49	+1	-4	-5
1953	7/53 – 5/54	6/53-3/54	-1	-2	-1
1957	8/57 – 4/58	9/57-3/58	+1	-1	-2
1960	4/60 – 2/61	3/60-12/60	-1	-2	-1
1970	12/69 – 11/70	9/70-12/70	+9	+1	-8
1974	11/73 – 3/75	12/73-3/75	+1	0	-1
1980	1/80 – 7/80	3/80-9/80	+2	+2	0
1982	7/81 – 11/82	9/81-3/82	+2	-8	-10
1990	7/90 – 3/91	6/90-3/91	-1	0	+1
2001	3/01 – 11/01	No Call	N/A	N/A	N/A
2008	12/07 – 6/09*	6/08-6/09	+6	0*	-6*

* The NBER has not yet made this call. Chart assumes the NBER will say the recession ended in June 2009.

By this rule, there was not a recession in the US in 2001. Also by this rule, recessions are generally shorter in duration (starting later and ending earlier) than the NBER's calls.

Data Sources:
(1) Real GDP data: St. Louis Fed/FRED GDPC1 series, as of Nov. 3, 2009.
http://research.stlouisfed.org/fred2/series/GDPC1/downloaddata?cid=106
(2) Non-farm payroll data: St. Louis Fed/FRED PAYEMS series, as of Nov. 3, 2009.
http://research.stlouisfed.org/fred2/series/PAYEMS?cid=11
(3) Industrial production data: St. Louis Fed/FRED IndPro series, as of Nov. 6, 2009.
http://research.stlouisfed.org/fred2/series/INDPRO?cid=3

(4) NBER recession calls and dates: National Bureau of Economic Research (NBER). http://www.nber.org/cycles/ (See below.)

Post-1900 Recessions per the NBER

BUSINESS CYCLE REFERENCE DATES

Peak	Trough
Quarterly dates are in parentheses	
September 1902(IV)	August 1904 (III)
May 1907(II)	June 1908 (II)
January 1910(I)	January 1912 (IV)
January 1913(I)	December 1914 (IV)
August 1918(III)	March 1919 (I)
January 1920(I)	July 1921 (III)
May 1923(II)	July 1924 (III)
October 1926(III)	November 1927 (IV)
August 1929(III)	March 1933 (I)
May 1937(II)	June 1938 (II)
February 1945(I)	October 1945 (IV)
November 1948(IV)	October 1949 (IV)
July 1953(II)	May 1954 (II)
August 1957(III)	April 1958 (II)
April 1960(II)	February 1961 (I)
December 1969(IV)	November 1970 (IV)
November 1973(IV)	March 1975 (I)
January 1980(I)	July 1980 (III)
July 1981(III)	November 1982 (IV)
July 1990(III)	March 1991(I)
March 2001(I)	November 2001 (IV)
December 2007 (IV)	