

EMPLOYMENT NUMBERS AS RECESSION INDICATORS

A JOINT ECONOMIC COMMITTEE STUDY



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Executive Summary

This paper investigates the value of employment data as real-time recession indicators. Among popular monthly labor measures, the unemployment rate is the most useful as an indicator of recession, whereas two top measures of employment growth – payroll jobs and civilian employment – have little value. Two other series, the labor force participation rate and the employment-population ratio, also provide little or no value in anticipating a recession. The best pre-recession employment indicator is actually weekly claims for unemployment insurance (UI). The paper reviews a new technique for predicting recessions, and develops an employment recession probability index. The index indicates a 35.5 percent chance that the U.S. economy is in recession, sharply up from 10 percent last month.

Employment Numbers as Recession Indicators

As 2008 begins, many observers believe the U.S. economy will enter a recession. This belief intensified during the latter half of 2007 because of rising oil prices, a weakening housing market, and sluggish employment numbers, despite strong quarterly gross domestic product (GDP) growth. Unfortunately, the official determination of a recession is notoriously slow, and it is difficult for even the best forecasters to know if a recession will happen. New techniques are being devised for assessing the probability of a recession which are more timely than the official assessment made by the National Bureau of Economic Research (NBER). This paper reviews the new approach, known as a “recession probability index” and then applies it to various employment numbers, both to assess the probability of a “jobs recession” and also to assess which labor indicators contain valuable information about the overall economy.

Background

At a January 15, 2008 hearing of the Congressional Joint Economic Committee, former Treasury Secretary Larry Summers said, “a recession is more likely than not. At this point this is or is very close to being a consensus judgment.” His remarks echo the sentiment of online trading markets such as intrade.com, where the odds of a recession occurring in 2008 have traded in a range of 50-70 percent in recent months.¹ As for professional forecasters, a poll by the Wall Street Journal finds that economists, on average, now put the chances of a recession during the next 12 months at 42.1 percent, the highest in more than three years, and double the risk assessment from a year ago.²

The irony of the consensus pessimism is that the U.S. economy was growing quite strongly in terms of GDP during recent quarters. Pre-recession inventory buildups can create a growth mirage, however, which adds to the uncertainty in knowing the current macroeconomic status in real-time. Forecasting an economic downturn in the business cycle is actually quite difficult, and surprisingly so. Officially, recessions are called only in retrospect, often by one or two years. The most recent example is that The Business Cycle Dating Committee at the NBER announced November 2001 as the end of the most recent recession – but it made this determination in July 2003, roughly a year and a half after the fact.

All macro data is backwards-looking by nature, which is why it is often said that making economic policy is like driving with the rearview mirror. Revisions to official data make identifying turning points in the business cycle harder still, and it often takes a year or more to get final revisions of some data series. Despite the difficulties, any kind of preview of an economic slowdown is valuable for policymakers.

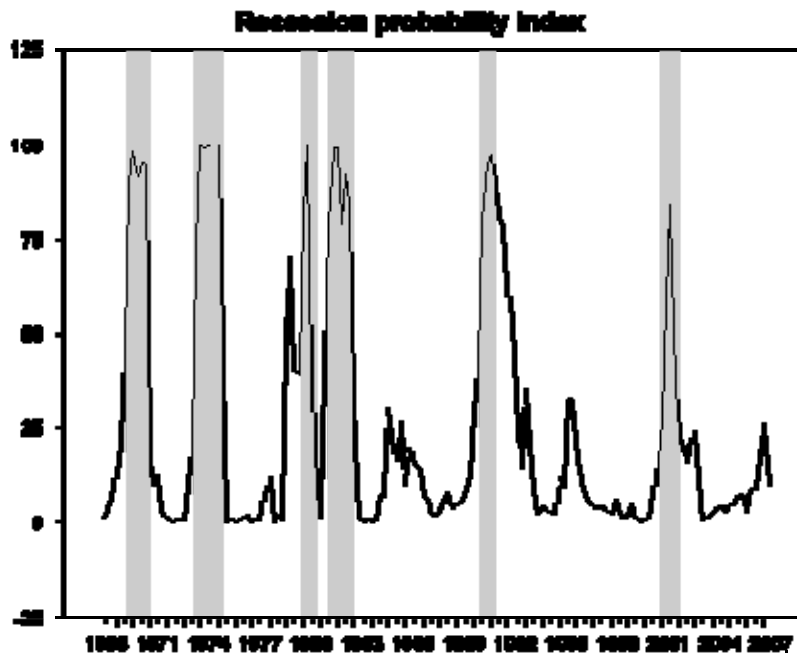
¹ See <http://www.intrade.com/aav2/trading/contractInfo.jsp?conDetailID=508654&z=1197401235332>.

² <http://online.wsj.com/public/resources/documents/info-flash08.html?project=EFORECAST07>.

In recent years, econometricians have been employing new statistical techniques that both move beyond the binary determination of a recession and also use real-time (originally published, unrevised) information. One method proposed by Professors Marcelle Chauvet and Jim Hamilton (2006) uses a recession probability index (RPI) between 0 and 100 percent, rather than a binary determination that the economy is or is not in a recessionary state. The authors suggest the economy enters a recession when the RPI rises above 65 percent. The various RPI models seem both accurate and timely in determining recessions, at least in hindsight. Applying their model(s) retroactively, Chauvet and Hamilton suggest it “would have beaten the NBER in calling the beginning of a recession in two out of four occasions,” and been much faster than the NBER in calling the end of a recession in all four occasions “with leads from three to seventeen months.”

It should be noted that Professor Hamilton maintains a publicly available Internet website with the currently calculated RPI at www.econbrowser.com. As of this writing, he reports a recession probability of just 9.5 percent for 2007Q2 based on data through 2007Q3. The figure below comes directly from the econbrowser.com website³, and one can see how closely the RPI tracks officially declared recessions.

**Figure 1. Recession Probability Index from Chauvet-Hamilton
(official recessions noted by gray bars)**



SOURCE: James D. Hamilton’s blog, www.econbrowser.com

Chauvet and Hamilton present multiple versions of their model, but their basic model uses the GDP series alone. The RPI in essence compares the current real GDP growth rate to the historical record. Actually, the historical record is analyzed using non-parametric and parametric mathematical methods, and their RPI model is enhanced with

³ http://www.econbrowser.com/archives/2007/10/gdp_up_recessio.html.

the inclusion of additional variables, notably those used by the NBER in determining recessions: income less transfers, employment, industrial production, and broad sales data in manufacturing and retail.

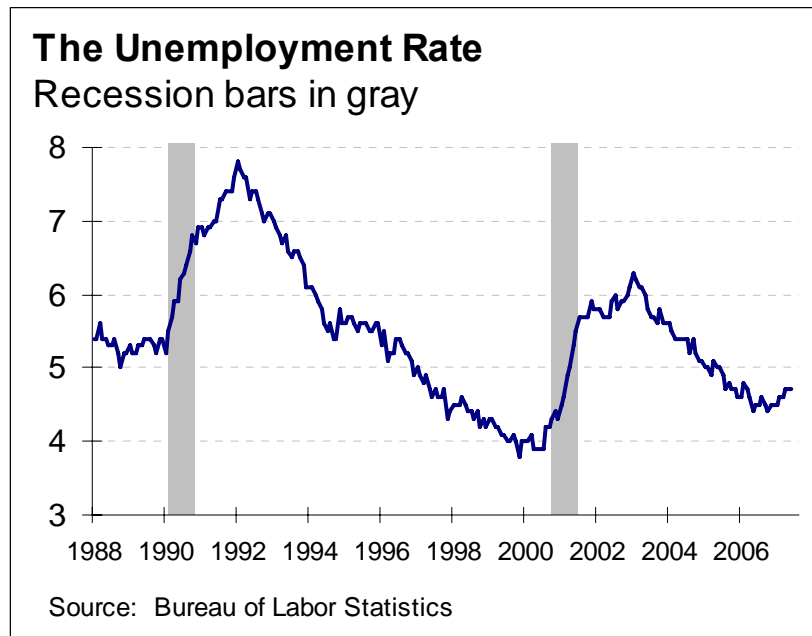
This paper takes a closer look at the idea of an employment recession and applies the Chauvet-Hamilton approach to various labor indicators. Such an approach is useful for three reasons. First, employment is considered the second pillar of NBER recession assessments, with real GDP being the first. In addition, maintaining full employment is half of the dual mandate of the Federal Reserve, with price stability being the other half. Finally, and perhaps most importantly for fiscal policy makers, there is a greater sensitivity to employment issues among the voting public, and most major economic debates are defined in terms of the possible impact on U.S. jobs. This is true of debates over trade policy, foreign relations generally (and especially with China in recent years), taxes, spending, and various plans to enhance economic activity. Overlaying the importance of employment as a key political-economic indicator to watch, there exists a belief that employment trends can become decoupled from GDP trends, such as witnessed during the “jobless recovery” of 2002-2004.

Some commentators contend that labor indicators are lagging or coincident, suggesting that they only show weakness after a recession is under way. I should make an important distinction here by what the term “pre-recession” indicator means. Conventionally understood macro indicators are understood to be “leading” or “coincident” or “lagging” in relation to the business cycle, and the unemployment rate has long been viewed as a lagging indicator. But the conventional understanding is based on a model which emphasizes time series correlations. The new approach is distinct and not directly comparable to conventional wisdom. An indicator may turn out to be “lagging” in the conventional sense, and yet also serve as a useful pre-recession indicator. How could that be? An analogy might be the occurrence of sinus congestion, which becomes more severe during the course of a common cold. Yet sinus congestion is also one of the first signs of the onset of illness. Despite the fact that sinuses tend to be most severely congested during the later stages of a cold (and often afterwards) which is a “lagging indicator,” a simple runny nose is often a valuable warning sign before other symptoms appear.

Unemployment during Recessions

The variable most often cited as evidence that the U.S. economy has been healthy in recent years is the low rate of unemployment. With a “natural rate” of unemployment believed to be somewhere between 5 and 6 percent, the current rate of 5.0 percent is widely interpreted as full employment. While this observation is compelling, it must be stated that the *level* of the unemployment rate does not seem to matter as much as its *change* in terms of correlating with a recession.

Figure 2. U.S. Unemployment Rate since 1998

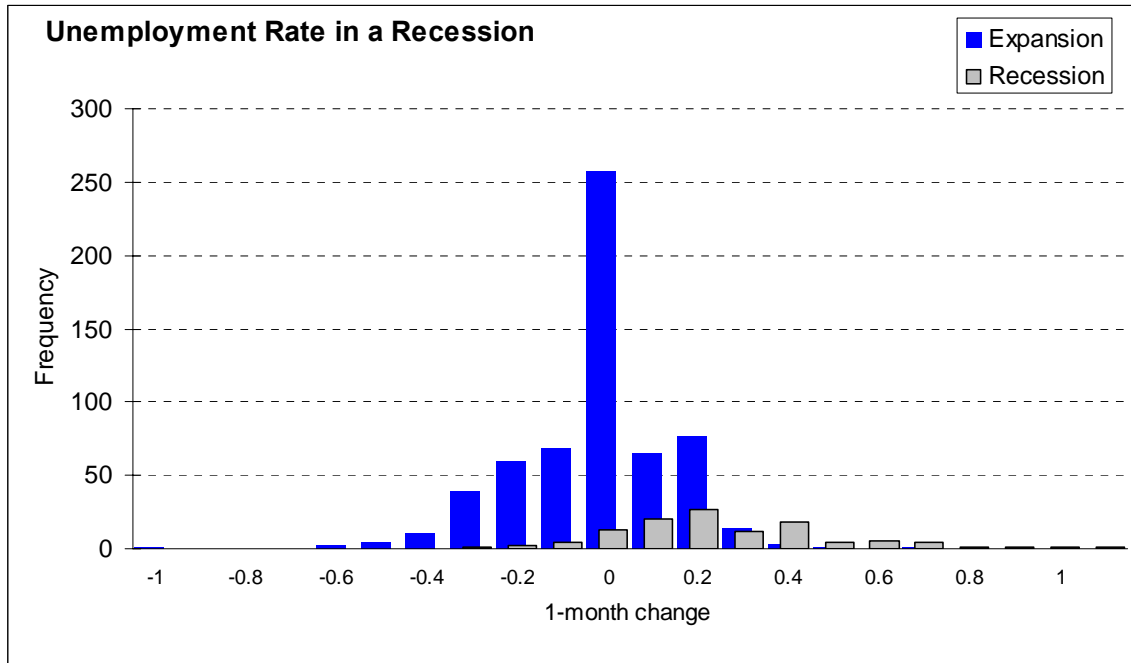


Unemployment has a reliable pattern of dramatic increases during recessionary periods. If one examines the series on the unemployment rate from 1948 to the present, the rapid see-saw is impressive in its regularity, deflating gradually after each of the ten recessions, a turnaround that normally begins promptly when the recession ends. This reliable pattern has failed to recur, and in fact the rate continued to climb during the first year of an expansion, only twice: the two most recent cycles (see Figure 2).

Casual observation also seems to show that a rise in the unemployment rate occurs simultaneously with the onset of a recession. A systematic examination of the data confirms this. Considering all 720 months from January 1948 – December 2007, 115 months are designated as recessions by the NBER. The unemployment rate rose by 0.23 points, on average, during recessionary months. In contrast, it declined by 0.04 points during typical expansionary months. The change in the unemployment rate will be annotated for the remainder of this paper as ΔU .

Given the above information, an occurrence of $\Delta U = 0.2$ or greater might intuitively suggest a recession. Likewise, if the unemployment rate is unchanged from one month to the next ($\Delta U = 0.0$), intuition suggests the economy is fine. In fact, there have been exactly 270 months when $\Delta U = 0.0$, using revised data published by BLS during January 2008. Of those 270 observations, 13 occurred during recessionary months. The naïve way to interpret a report of $\Delta U = 0.0$, therefore, is that it implies a 4.8 percent probability of recession. A distribution of all 720 unemployment observations is shown graphically in Figure 3, and categorized in two states (recession or expansion) according to the NBER dates. It turns out that even when $\Delta U = 0.2$, there is a 74 percent probability the economy is not in a recession.

Figure 3. U.S. Unemployment Rate Histogram (720 observations, 1948-2007)



Given this basic data, one can calculate the probability of a recession using Bayes Law, which states the probability of a recession given a value of ΔU at the time equals the number of months declared by the NBER to be recessionary when ΔU equaled that value divided by the total number of months ΔU equaled that value. The equation describing this is

$$(1) \Pr(\text{Recession} | \Delta U_t) = f(\Delta U = \Delta U_t | \text{Recession}) / f(\Delta U = \Delta U_t)$$

where $f(\Delta U)$ is a function that counts the number of periods when ΔU was the same value as during the period in consideration. Using this approach, one finds the following recession probability estimates presented in Table 1:

Table 1. Bayesian Probability of a Recession (using a 1-month change in the rate of unemployment)

<u>ΔU (1 month)</u>	<u>Probability of Recession</u>
-0.4 or lower	0%
-0.3	2%
-0.2	3%
-0.1	6%
0	5%
0.1	24%
0.2	26%
0.3	46%
0.4 or higher	88%

This approach becomes even more useful when a moving sum is considered. Summing up the most recent three months of unemployment rate changes yields the following Bayesian probability of recession in Table 2. This 3-month change indicates with much more certainty that an unchanging rate of unemployment is very rarely recessionary. Only when ΔU equals 0.5 or more over three months can one say with confidence that the economy is *in* a recession.

Table 2. Bayesian Probability of a Recession (using a 3-month change in the rate of unemployment)

<u>ΔU (3month)</u>	<u>Probability of Recession</u>
-0.1 or lower	2%
0	3%
0.1	8%
0.2	15%
0.3	28%
0.4	42%
0.5 or higher	84%

This kind of knowledge is informative, but has two limitations. First, the vast majority of observations are clustered around $\Delta U = 0.0$, and second, this analysis is based on the premise of two binary states – recession or expansion. What might be more useful to know is if the economy is on the verge of a recession, described in the academic literature as a turning point.

When the series is categorized into six states (using the NBER recession dates as markers), one might be able to observe an uptick in the unemployment rate in the few months before a recession as an early warning. The six states of the economy are here defined as

- (1) The year before a recession, subdivided into the months 4-12 and
- (2) The months 1-3 before a recession;
- (3) The first 3 months after a recession has begun;
- (4) The heart of a recession, 4+ months after its starting month;
- (5) The year after a recession (months 1-12);
- (6) The normal expansionary period (months 13+ after a recession ends).

Only two states (2 and 3) have a set number of observations: 30 each, due to the 10 turning points since the data series begins in January 1948. There are 81 monthly observations in state (1) and 84 observations in state (4). There are fewer observations in state (5) than one might expect – 113 months instead of 120 – because some of these early expansions are truncated by the rapid onset of another recession. Normal expansions in state (6) account for the remaining 382 months.

Table 3. Unemployment Rate During the Business Cycle, 1948-2007

	State (1) Pre-Rec. 4-12 Mo	State (2) Pre-Rec. 1-3 Mo	State (3) Rec. 1-3 Mo	State (4) Rec. 4+ Mo	State (5) Expans. 1-12	State (6) Expans. 1yr+
ΔU 1-month	-0.03	0.02	0.12	0.27	-0.10	-0.03
<i>Std Dev</i>	0.17	0.20	0.17	0.26	0.24	0.15
ΔU 3-month MA	-0.02	0.01	0.07	0.25	-0.06	-0.04
<i>Std Dev</i>	0.10	0.10	0.08	0.15	0.16	0.07
ΔU 12-month	-0.42	-0.17	0.17	1.60	1.03	-0.55
<i>Std Dev</i>	0.64	0.41	0.44	0.97	1.44	0.63

Turning Point = (2) and (3)

Table 3 summarizes the behavior of the unemployment rate series in terms of average change across the six states. This confirms that the unemployment rate rises modestly before a recession (+0.02), starts to increase with the onset of recession (+0.12), and then rapidly rises during the heart of a recession (+0.27). Historically, the rate declines most sharply in the year after a recession, then continues to decline slowly during the main period of expansion over many years, though this pattern has not been observed in the most recent expansions as noted earlier.

The key question is whether ΔU is a reliable pre-recession warning sign. Considering that the pre-recessionary state is not known as it is happening, the turning point can be usefully defined as the three months before and after a recession starts (states 2 and 3 together). We already know that the 1-month ΔU averages +0.27 during the main months of a recession, and averages -0.03 during the main months of an expansion. However, it appears there is a tendency for ΔU to show a sign of increase during the turning point. It tends to be essentially unchanging during the states (1) and (2), but then rises an average of 0.12 points per month during state (3). The standard deviation of 1-month ΔU is stable at around 0.2 for all six periods. That seems to be high enough variation to warrant a large dose of caution in using the series.

Two other treatments of the data in Table 3 are a 3-month moving average and a 12-month change. A 3-month moving average seems to be slightly better, showing a trough during the year before a recession begins, with half the variance, but also showing only half the average increase during state (3). That is, the moving average moderates the movements in the original series, but by doing so misses the rapid rise in the series which serves as the main warning of recession. The 12-month change indicates a continued decline in unemployment during pre-recessionary months, and in general its inclusion here is to reveal that it is not especially useful as a pre-recession measure.

All in all, the unemployment rate does contain valuable information about the occurrence of a recession. The absolute level of the rate of unemployment is less meaningful than its rate of change. Unfortunately, the volatility around the monthly change is very noisy for an indicator that moves in such discrete and gradual increments. The above analysis yields a useful rule of thumb: three months in a row of rising

unemployment are a very strong sign of an oncoming recession, especially if they add up to a half-point increase or greater.

Comparing Employment Indicators

The monthly publication of the BLS Employment Situation report is a major event for the media, most notably the interest on Wall Street. In any given month, three indicators may move in a positive direction while another three can be found that move in a negative direction. Any bull or bear can find a data series to their liking. The unemployment rate is traditionally the most important of them all, but nonfarm payroll job growth has become another closely watched number, along with news about whether its growth exceeded expectations (which range from 50,000-150,000). Even if both those numbers are interpreted as moving the same way, contrarians will point to the “household survey” measure of employment growth, or the labor force participation rate, or the ratio of employment to population, to make their point. Here I assess how each of these numbers performs as a pre-recession indicator.

The reality is that one indicator is given far more public and media attention than any other by far, and that is the monthly payroll employment number, technically known as the non-farm change in payroll employment as measured by the Current Employment Statistics (CES) survey of payroll establishments.⁴ A long-standing discussion among both scholars and the public has focused on whether this CES or “payroll” number is the best measure of job creation. The primary alternative is a similar number published in the same monthly BLS report, which is the change in the total number of civilian employees, a number derived from the Current Population Survey (CPS) of households. These numbers are different in many ways, by survey methodology and also by definition: one is a measure of jobs, while the other is a measure of workers. More detail on such matters is available in numerous papers (e.g., Kane 2004), and from the BLS itself, but that is not a central concern in this paper. Rather, the simple question being asked here is: Are these data series useful as pre-recession indicators?

The nature of the CES and CPS numbers is important because how they are originally presented is not how they are recorded eventually, only because raw data are properly revised for accuracy. Indeed, the CES series in particular is published as a “preliminary” number, and each monthly figure is revised during the succeeding two monthly releases. Moreover, the CES is revised during an annual benchmark which has often led to large shifts in the entire time series. In contrast, the CPS is volatile from one month to the next, but is rarely revised, and never revised significantly. The concern is that a revised series may tell policymakers that indicator X is useful, when the real-time number for that series is actually not useful. This paper addresses that concern by considering both the real-time series for CES and the revised series for CES. In addition, the real-time net series is also assessed. Likewise, the CPS series is presented, as well as a 3-month moving average of the CPS which will be less timely but also much less volatile than the raw CPS series.

⁴ <http://www.bls.gov/ces/>.

An example of how this shapes the impression of the labor market may be useful: on the first Friday in September this year, the BLS Employment Situation reported that in August the U.S. economy experienced a payroll *job* decline of 4000 jobs and a civilian *employee* decline of 316,000. The payroll number was the first job loss in four years, and was widely cited. The household survey figure was obviously much larger, but was not as worrisome due to the much higher volatility in that series. However, one month later the payroll number was revised sharply upwards revealing a net increase of 89,000 jobs, in addition to the newly published number of 110,000 jobs. All told the new data plus revisions to the recent two months results in a “net” payroll job growth figure that is often more insightful than the preliminary headline number. In contrast, the CPS figure for August was unrevised, but its September figure was a large increase of 463,000.

The following Table 4 shows how multiple employment series perform during the six time states defined above, in terms of the average change and standard deviation. In addition to CES and CPS measures of job growth, I also examine the CPS civilian labor force participation rate (ages 16+), the CPS civilian employment-to-population ratio (ages 16+), initial claims for unemployment insurance (UI), and continuing claims of UI (note: both UI series are monthly averages of weekly claims, compiled by Haver Analytics).

Table 4. Change in Employment Indicators During the Business Cycle, 1948-2007, units in thousands

	State (1) Pre-Rec. 4-12 Mo	State (2) Pre-Rec. 1-3 Mo	State (3) Rec. 1-3 Mo	State (4) Rec. 4+ Mo	State (5) Expans. 1-12	State (6) Expans. 1yr+
Payroll (CES)	178	71	-29	-168	144	200
<i>Std Dev</i>	189	107	168	170	205	135
Payroll real-time	147	96	-13	-183	103	173
<i>Std Dev</i>	154	151	166	186	184	146
Payroll r-t net	170	134	27	-170	116	193
<i>Std Dev</i>	172	160	173	226	199	158
Civ. Employment	168	4	-14	-105	151	176
<i>Std Dev</i>	350	364	363	294	313	245
Civ. Employ. MA	156	123	28	-94	103	178
<i>Std Dev</i>	132	122	139	135	155	118
LF Participation %	0.03	-0.08	0.00	0.02	-0.01	0.02
<i>Std Dev</i>	0.25	0.26	0.30	0.21	0.22	0.17
Emp-Pop Ratio %	0.04	-0.08	-0.07	-0.15	0.05	0.04
<i>Std Dev</i>	0.26	0.27	0.29	0.23	0.23	0.17
UI initial claims	1	7	14	13	-12	-1
<i>Std Dev</i>	25	11	19	28	20	14
UI continuing	4	43	76	138	-67	-13
<i>Std Dev</i>	52	42	43	111	111	51

Analysis of this information is easier if put in percentage terms, relative to the average observation during a recession. Table 5 compares the average change in each cell to the average of that indicator during state (4). By definition, that period in the fourth column reports 100 percent for each of the variables. Variables that are cyclical in nature would logically have average values that are negative percentages during non-recessionary periods, and this is indeed the case in the last column which covers the primary months of expansions that are not turning points.

**Table 5. Change in Employment Indicators During the Business Cycle, 1948-2007
(relative to a recession)**

	State (1) Pre-Rec. 4-12 Mo	State (2) Pre-Rec. 1-3 Mo	State (3) Rec. 1-3 Mo	State (4) Rec. 4+ Mo	State (5) Expans. 1-12	State (6) Expans. 1yr+
Payroll	-106%	-42%	17%	100%	-86%	-119%
Payroll real-time	-80%	-52%	7%	100%	-56%	-95%
Payroll r-t net	-100%	-79%	-16%	100%	-68%	-114%
Civ. Employment	-160%	-4%	13%	100%	-144%	-168%
Civ. Emp. MA	-166%	-130%	-30%	100%	-109%	-189%
LF Participation	126%	-335%	13%	100%	-52%	78%
Emp-Pop Ratio	-27%	53%	50%	100%	-33%	-27%
UI initial claims	7%	51%	102%	100%	-86%	-6%
UI continuing	3%	31%	55%	100%	-49%	-9%
Unemployment	-10%	9%	45%	100%	-36%	-12%
Unemploy. MA	-9%	4%	26%	100%	-23%	-15%

The second column – state (2) – is of utmost interest. If a variable has recessionary warnings, its average value should be a positive percentage, implying it is recession-like, immediately prior to a recession. We see that the average change in payrolls is the wrong sign after revisions (-42%) and before revisions (-52%), and especially the net real-time number (-79%). In contrast, the CPS employment number does approach zero (-4%), and is therefore much better at signaling a slowdown, but its moving average is uninformative (-130%). The labor force participation rate (LFPR) is actually bizarre, because it seems to give an outside non-recessionary reading before a recession (-335%), but it is bizarre because the participation rates actually tend to rise during recessions at the same rate as during expansions. The monthly change in LFPR also has high variance relative to its normal average growth, which makes it, in simple terms, a poor indicator of economic activity.

In sharp contrast, the employment-to-population ratio (EPOP) and both measures of UI claims seem to be valuable pre-recession indicators. This is true especially during the 1-3 months pre-recession when EPOP is rising at 53 percent of the recessionary rate, initial claims are rising at 51 percent, and continuing claims are rising at 31 percent. The signal is even stronger during the first three months inside a recession for UI claims (but not EPOP). What is especially valuable is that both UI series show recessionary signs during the 4-12 month period prior to a turning point.

For those who think employment growth matters, unfortunately the CPS series is also highly volatile, a trait confirmed in the standard deviation of 364,000, which is more

than double the standard deviation of any payroll number. Even though the CPS civilian employment number is a superior pre-recession indicator according to Table 5, its moving average is not. In sum, no employment indicator is particularly useful. During the first three months inside a recession, two widely cited employment indicators both tend to send the wrong signal (these are the average net payroll growth and the household employment moving average). That is, they both show employment growth, even though a recession is defined by employment decline.

The volatility of all these series warns observers not to take any one observation too seriously. The average employment change for both payroll and household series is equal to or slightly exceeded by the standard deviation, for example. That level of volatility is basically the same during all periods. Likewise, the standard deviation of UI claims are higher than observed average values, but not excessively so.

Reliability of Employment Signals

In an attempt to quantify the reliability of the employment numbers in this context as pre-recession indicators, this section presents a brief discussion and solution. High variance in the series makes any one observation for any of the series prone to sending a bad signal. It would not be proper to measure reliability of any one of the indicators by measuring its average value as a ratio of its standard deviation, principally because the average value during the turning point (state 2 or 3) will often be zero by nature. Instead, indicator reliability is defined as its average value during normal trends (state 4 or 6) relative to standard deviation during the turning point. Some series will rise sharply and decline slowly during the cycle, and others will rise slowly but recover quickly. So as not to bias the comparison, I define the reliability as a combination of average recessionary tendencies and average expansionary tendencies in absolute values. Using σ to symbolize the standard deviation of variable X, the equation used to measure reliability is:

$$(2) \quad \text{Reliability of X} = \frac{|\bar{X}_{\text{expansion}}| + |\bar{X}_{\text{recession}}|}{2 \times \sigma_{\text{turning-point}}}$$

A higher value implies more reliability, and a simple rule of thumb is that a reliability score below unity means the data is unreliable. Results are presented below, comparing an average of reliability for states 2 and 3, coupled with an average of their turning-point values (states 2 and 3) from above.

Table 6. Value and Reliability of Turning-Point Indicators (best in bold)

	Value	Reliability
Unemployment (CPS)	27%	0.8
Unemployment MA	15%	1.6
Unemployment 12m	0%	2.5
Payroll (CES)	-13%	1.3
Payroll real-time	-23%	1.1
Payroll real time net	-47%	1.1
Civilian Employ. (CPS)	5%	0.4
Civilian Employ. MA	-80%	1.0
LF Participation (CPS)	-161%	0.1
Emp-Pop Ratio (CPS)	51%	0.3
UI initial	76%	0.5
UI continuing	43%	1.8

The first conclusion to be drawn from table 6 is that weekly UI data are superior recession indicators. The most surprising finding, contrary to conventional wisdom, is that both payroll and household employment measures are of no value as recession indicators. The 1-month change in the unemployment rate has value, but is perhaps prone to false signals due to its moderately high variance. The employment-to-population ratio has notable value: twice as much as the unemployment rate according to Table 6, but with roughly one-third of the reliability. Finally, we have learned that unemployment insurance claims are very valuable and reliable pre-recession indicators. The fact that the UI data is released weekly makes it even more timely, and so it merits close attention.

Creating an Employment-based Recession Probability Indicator

The purpose of the preceding section was to assess which data series should be given attention by economic observers and policymakers. It was also a preparatory step for the design of an RPI based on employment data. The two employment series that merit inclusion are UI claims and the unemployment rate. This section proceeds to develop the RPI methodology and present the index.

The behavior of initial and continuing claims are strongly counter-cyclical, and it is not altogether clear which series is better. However, initial claims have been measured since 1948, whereas continuing claims have only been measured since 1967. The longer series (initial UI) is preferable for inclusion in the RPI.

Turning now to the construction of an RPI, we have a choice between two competing objectives: accuracy and timeliness. A timely indicator will be sensitive to the smallest changes in source data, but this will yield more false signals. More accuracy can be achieved by measuring source data with a moving average or some other method for converting the raw signal to pick up trends in the data. Emphasizing accuracy by smoothing the data will tend to sacrifice some timeliness. This produces fewer false warnings, but can also result in identifying a recession only after it has started. The RPI

presented here is an effort to balance both objectives. I use a 3-month moving average (denoted MA) for the unemployment rate change and the initial change in jobless claims. The former was presented in Table 2 above, and the latter is presented in Table 7 and Figure 4.

Figure 4. Histogram of Unemployment Insurance Claims Since 1948

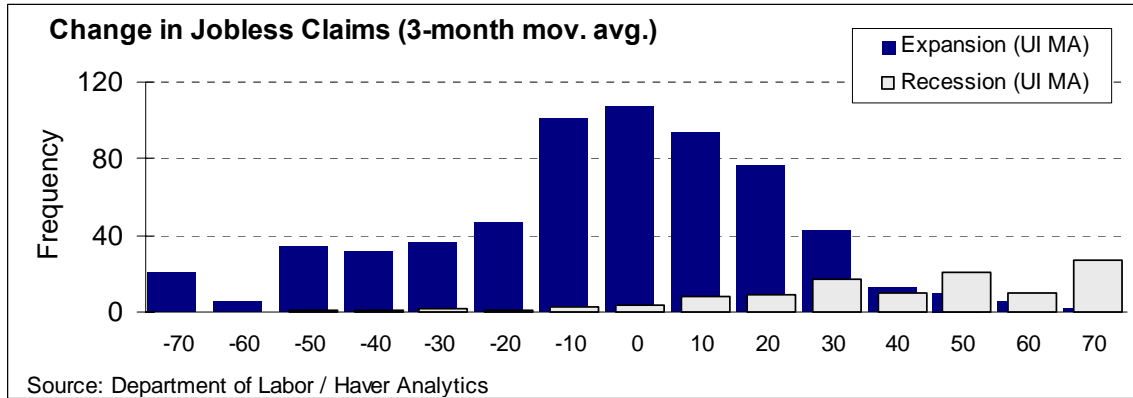
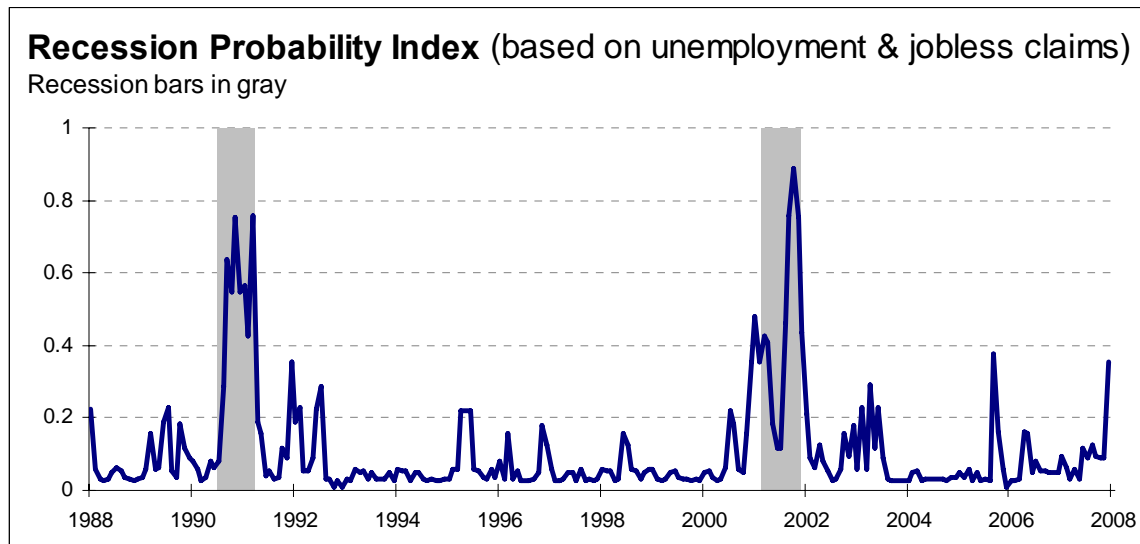


Table 7. Bayesian Probability of a Recession (using a 3-month change in initial jobless claims)

<u>ΔUI claims</u>	<u>Probability of Recession</u>
-50 or less	0%
-49 to -10	3%
0	4%
10	8%
20	10%
30	29%
40	43%
50	68%
60	67%
More	94%

Converting histogram data for initial jobless claims into a recession probability index time series from 1948, and mixing that with an unemployment rate RPI yields a combined RPI that is presented in Figure 5.

Figure 5. Employment Recession Probability Index (1988- 2008)



The series actually extends from 1948, but is presented in truncated form so that details can be observed. This RPI consistently rises above 60 percent during recessions, and rarely rises above 20 percent during expansions. Casually reviewing the charted data, this RPI does not appear to give a pre-recession warning (2001 being an exception), but it is extremely timely with a signal during the first few months of a recession.

The combined employment-data RPI indicates that as of December 2007, there is 35.5 percent chance that the U.S. economy is in recession. The half of the RPI based on the unemployment rate is at 28 percent, and the half based on initial UI claims is at 43 percent – both represent sudden one-month movements. This is a moderately strong warning sign, and the upcoming data releases will be very compelling. A similarly high reading occurred most recently in September 2005, but the RPI dropped back immediately one month later, and no recession occurred.

Conclusion

This paper investigated the value of employment data as real-time recession indicators. Among the most popular monthly labor measures, the unemployment rate is the most useful as an indicator of recession, whereas two top measures of employment – payroll job growth and CPS employment growth – have little value. Specifically, the average change in employment measures during the three months before and after a recessionary turning point are poor warning signs. Payrolls continue to grow in real-time, albeit with high volatility and uncertain revisions, whereas CPS data show measurable slowdowns on average but with very large variation. The unemployment rate is more accurate as a recessionary indicator, but another data series is even more valuable in that respect – claims for unemployment insurance (UI).

This paper next offered an introduction to a new type of statistical tool developed by academic economists in recent years: the recession probability index. It developed

such an index using data on monthly changes in the unemployment rate and initial UI claims. The resulting RPI is reliable as an early-warning signal when the real economy enters a recession during its first few months. It operates much faster than the NBER can normally declare the beginning of a recession. While the paper's RPI is not as sophisticated as those in the academic literature, it does suggest that more sophisticated models should be looking beyond job growth numbers to other measures of the labor market's status. The RPI created for this paper is based on a histogram which utilizes bins of data, whereas future research which applies density estimation will arguably provide greater accuracy.

Finally, the current value of this paper's RPI at this time (35.5 percent) should be taken with a grain of salt – it is based on simultaneous spikes in the two employment numbers utilized. Already in 2008, weekly jobless claims are declining dramatically (from 344,000 a month ago to 314,750 last week), and the RPI index will almost certainly decline as a result. The real economy may be robust, but the financial side of the economy faces serious challenges in the wake of the subprime mortgage crisis. A financial recession may well create duress into the real economy, causing a genuine contraction in output and employment. Whether this happens, the evidence provided in this paper hopefully gives observers of the U.S. economy a better sense of what numbers to watch.

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Data Appendix. Unemployment Rate, Initial Unemployment Insurance Claims

	(1) U. Rate <i>3-month change</i>	(2) UI Claims <i>3-month change</i>	RPI for (1)	RPI for (2)	RPI
Jan-00	-0.1	3	2%	8%	5%
Feb-00	0.0	10	3%	8%	6%
Mar-00	0.0	-7	3%	4%	4%
Apr-00	-0.2	-17	2%	3%	3%
May-00	-0.1	-9	2%	4%	3%
Jun-00	0.0	17	3%	10%	7%
Jul-00	0.2	26	15%	29%	22%
Aug-00	0.1	28	8%	29%	19%
Sep-00	-0.1	11	2%	10%	6%
Oct-00	-0.1	5	2%	8%	5%
Nov-00	-0.2	24	2%	29%	16%
Dec-00	0.0	48	3%	68%	36%
Jan-01	0.3	41	28%	68%	48%
Feb-01	0.3	37	28%	43%	36%
Mar-01	0.4	40	42%	43%	43%
Apr-01	0.2	51	15%	67%	41%
May-01	0.1	25	8%	29%	19%
Jun-01	0.2	8	15%	8%	12%
Jul-01	0.2	2	15%	8%	12%
Aug-01	0.6	2	84%	8%	46%
Sep-01	0.5	47	84%	68%	76%
Oct-01	0.7	77	84%	94%	89%
Nov-01	0.6	53	84%	67%	76%
Dec-01	0.7	-39	84%	3%	44%
Jan-02	0.4	-67	42%	0%	21%
Feb-02	0.2	-55	15%	3%	9%
Mar-02	0.0	16	3%	10%	7%
Apr-02	0.2	19	15%	10%	13%
May-02	0.1	5	8%	8%	8%
Jun-02	0.1	-30	8%	3%	6%
Jul-02	-0.1	-41	2%	3%	3%
Aug-02	-0.1	-8	2%	4%	3%
Sep-02	-0.1	19	2%	10%	6%
Oct-02	-0.1	21	2%	29%	16%
Nov-02	0.2	-4	15%	4%	10%
Dec-02	0.3	3	28%	8%	18%
Jan-03	0.1	-8	8%	4%	6%
Feb-03	0.0	31	3%	43%	23%
Mar-03	-0.1	14	2%	10%	6%
Apr-03	0.2	39	15%	43%	29%
May-03	0.2	2	15%	8%	12%
Jun-03	0.4	-3	42%	4%	23%
Jul-03	0.2	-31	15%	3%	9%
Aug-03	0.0	-23	3%	3%	3%
Sep-03	-0.2	-30	2%	3%	3%
Oct-03	-0.2	-30	2%	3%	3%

Nov-03	-0.3	-37	2%	3%	3%
Dec-03	-0.4	-35	2%	3%	3%
Jan-04	-0.3	-17	2%	3%	3%
Feb-04	-0.2	4	2%	8%	5%
Mar-04	0.1	-13	8%	3%	6%
Apr-04	-0.1	-12	2%	3%	3%
May-04	0.0	-28	3%	3%	3%
Jun-04	-0.2	0	2%	4%	3%
Jul-04	-0.1	-5	2%	4%	3%
Aug-04	-0.2	0	2%	4%	3%
Sep-04	-0.2	-8	2%	4%	3%
Oct-04	-0.1	-10	2%	3%	3%
Nov-04	0.0	-9	3%	4%	4%
Dec-04	0.0	-8	3%	4%	4%
Jan-05	-0.2	3	2%	8%	5%
Feb-05	0.0	-8	3%	4%	4%
Mar-05	-0.2	11	2%	10%	6%
Apr-05	-0.1	-10	2%	3%	3%
May-05	-0.3	6	2%	8%	5%
Jun-05	-0.2	-14	2%	3%	3%
Jul-05	-0.1	-6	2%	4%	3%
Aug-05	-0.2	-10	2%	3%	3%
Sep-05	0.1	63	8%	67%	38%
Oct-05	0.0	21	3%	29%	16%
Nov-05	0.1	-2	8%	4%	6%
Dec-05	-0.3	-75	2%	0%	1%
Jan-06	-0.3	-50	2%	3%	3%
Feb-06	-0.3	-13	2%	3%	3%
Mar-06	-0.1	-7	2%	4%	3%
Apr-06	0.0	21	3%	29%	16%
May-06	0.0	25	2%	29%	16%
Jun-06	-0.1	2	2%	8%	5%
Jul-06	0.0	1	8%	8%	8%
Aug-06	0.0	-11	8%	3%	6%
Sep-06	-0.1	6	3%	8%	6%
Oct-06	-0.3	1	2%	8%	5%
Nov-06	-0.2	8	2%	8%	5%
Dec-06	-0.1	5	2%	8%	5%
Jan-07	0.2	-3	15%	4%	10%
Feb-07	0.0	12	3%	10%	7%
Mar-07	0.0	-3	2%	4%	3%
Apr-07	-0.1	16	2%	10%	6%
May-07	0.0	-31	3%	3%	3%
Jun-07	0.2	2	15%	8%	12%
Jul-07	0.2	-20	15%	3%	9%
Aug-07	0.2	18	15%	10%	13%
Sep-07	0.1	-6	15%	4%	10%
Oct-07	0.1	19	8%	10%	9%
Nov-07	0.0	15	8%	10%	9%
Dec-07	0.3	31	28%	43%	36%

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