

US Business Cycle Risk Report

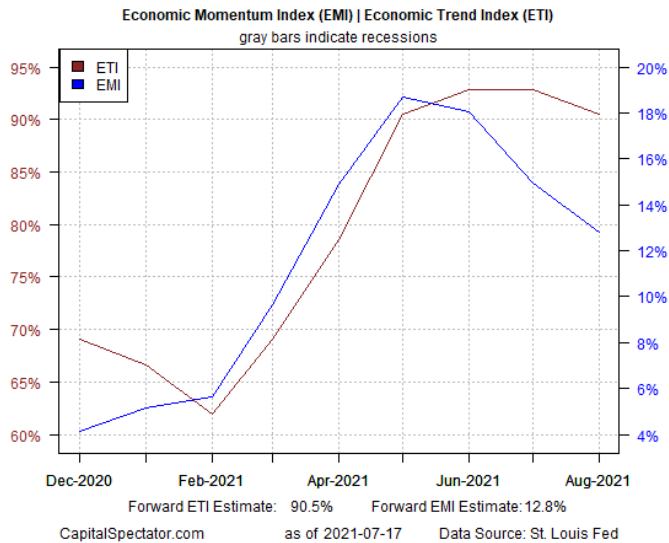
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The US economy continues to reflect strong growth, but the evidence is mounting that peak activity is behind us. But that doesn't change the fact that recession risk remains virtually nil and for the foreseeable future the probability of economic contraction will remain low (short of an unforeseen exogenous shock).

A key part of the deceleration underway is diminishing federal stimulus spending and normalizing economic activity following the reopening shock via lifting pandemic restrictions, which unleashed a potent growth driver born of pent-up demand. As the transition unfolds, the effect is expected to take some of the wind out of the recent inflationary surge.



Meanwhile, today's update of forward estimates of ETI and EMI reflect another round of moderate economic deceleration. In particular, last week's data releases trimmed EMI's August estimate, which slipped to 12.8% from 15.2% in previous update (see chart at left and bottom of p. 2). That's still a strong reading, but it's another hint that the economy's peaked and is decelerating.

The main macro focus: How fast will it slow and how far out does the slowdown extend before triggering a significant increase in recession risk? Unclear at this stage, but available numbers to date strongly suggest that macro risk will remain subdued for at least the near term.

A key variable, as always: How does the Federal Reserve's monetary policy evolve? In particular: **Will the Fed at some point in the near future feel compelled to start tightening policy to manage firmer inflation risk?** Fed funds futures are

currently pricing in a near-zero probability of a rate hike through the end of the year. The policy-sensitive 2-year Treasury yield remains near pandemic lows but has turned higher over the past month, which hints at the market's evolving focus on the (still-low) possibility that the Fed may be forced to tighten sooner than previously expected.

The week's main events for economic data: housing starts for June (Tues., July 20) and Friday's preliminary estimates of economic activity for July via PMI survey data. On both fronts, economists expect strong growth readings will continue to prevail.

Mon, Jul 19 Housing Market Index (Jul)

Tues, Jul 20 Housing starts (Jun)

Wed, Jul 21 No major US economic reports scheduled

Thurs, Jul 22 Jobless claims (wk 7/17), Chicago Fed Nat'l Activity Index (Jun), existing home sales (Jun), Leading Economic Index (Jun), KC Fed Mfg Index (Jul)

Fri, Jul 23 Composite/Mfg/Services PMIs (Jul)

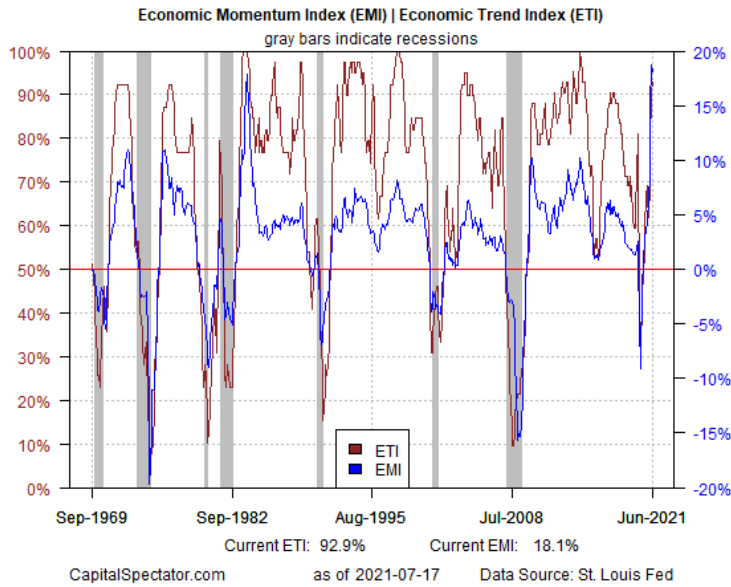
Standard Methodology		
Current Business Cycle Index Values	page	Current Recession-Risk Probability *
ETI 92.9% (Jun)	2-3	ETI 0.3% (Jun)
EMI 18.1% (Jun)	2-3	EMI 0.0% (Jun)
MMRI 17.9% (Jul 16)	4	MMRI 4.6% (Jul 16)
CFNAI-MA3 0.81 (May)	5	CFNAI-MA3 2.3% (May)
ADS Index 0.771 (Jul 10)	6	ADS Index 6.1% (Jul 10)
	9	CRPI 2.3% (Jul 16)
as of: 7/18/2021 * based on probit model estimates		
Q2:2021 GDP 9.0%	10	
Key Economic Indicators	11	

Short-Focus Methodology		
Current Business Cycle Index Values	page	Current Recession-Risk Probability *
ETI (monthly) 92.9% (Jun)	2-3	ETI (monthly) 0.3% (Jun)
EMI (monthly) 15.0% (Jun)	2-3	EMI (monthly) 0.1% (Jun)
MMRI 17.9% (Jul 16)	4	MMRI 4.6% (Jul 16)
CFNAI (monthly) 0.29 (May)	5	CFNAI (monthly) 9.8% (May)
ADS Index 0.771 (Jul 10)	6	ADS Index 6.1% (Jul 10)
WEI (weekly) 8.59 (Jul 10)	7	WEI (weekly) 1.7% (Jul 10)
	8	Short CRPI 5.3% (Jul 16)
as of: 7/18/2021 * based on probit model estimates		

low risk	medium-high risk
medium-low risk	high risk

See parameter rule definitions on p. 12

ETI and EMI



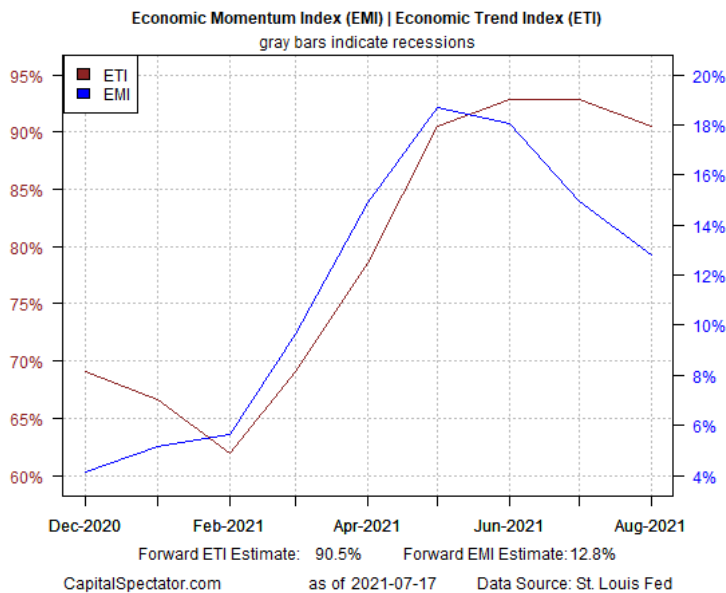
ETI is a diffusion index (i.e., an index that tracks the proportion of components with positive values) for the 14 leading/coincident indicators (see p. 11). ETI values reflect the 3-month average of the transformation rules defined in the table on p. 9. EMI measures the same set of indicators/transformation rules based on the 3-month average of the median monthly percentage change for the 14 indicators.

ETI values above (below) 50% align with growth (recession). EMI values above (below) 0% align with growth (recession).

The methodology for calculating ETI and EMI is detailed in:

Nowcasting The Business Cycle:
A Practical Guide For Spotting Business
Cycle Peaks
(2014, Beta Publishing).

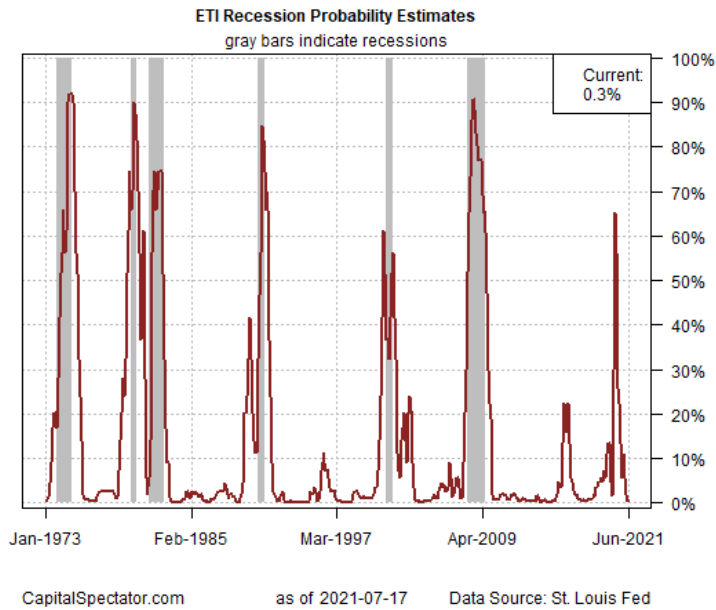
Near-term projections: ETI and EMI



For near-term projections of ETI and EMI, the missing data points are estimated with an ARIMA model.

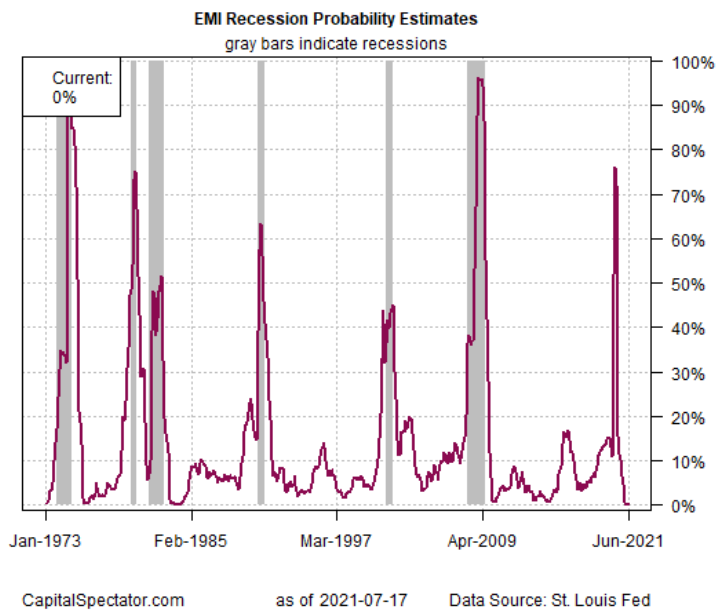
Forecasts are always suspect, of course, but recent projections of ETI & EMI for the near-term future have proven to be relatively reliable guesstimates vs. the full set of published numbers that followed. That's not surprising, given the broadly diversified nature of ETI & EMI. Predicting individual components, by contrast, is prone to far more uncertainty in the short run. The assumption here is that while any one forecast for a given indicator will likely miss the mark, the errors may cancel out to some degree by aggregating a broad set of predictions. That's a reasonable assumption based on the historical record for the forecasts.

Recession risk probability: ETI



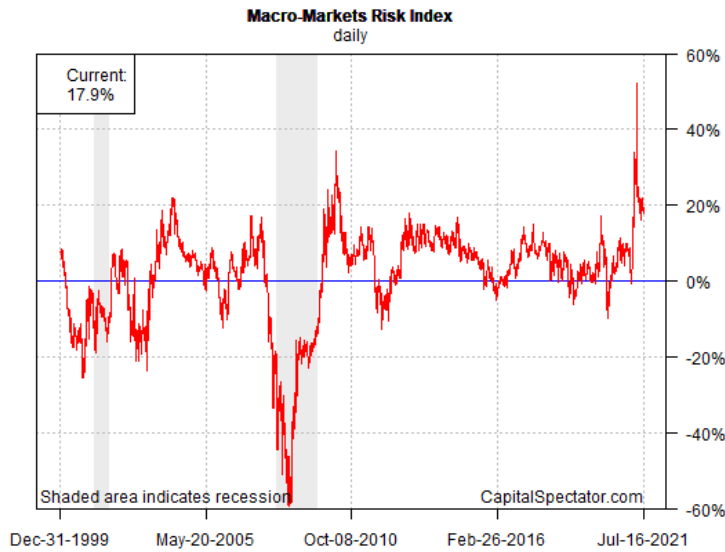
A probit model translates ETI's values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: EMI



A probit model translates EMI's values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Macro-Markets Risk Index



Data: BoAML, Quandl, St. Louis Fed

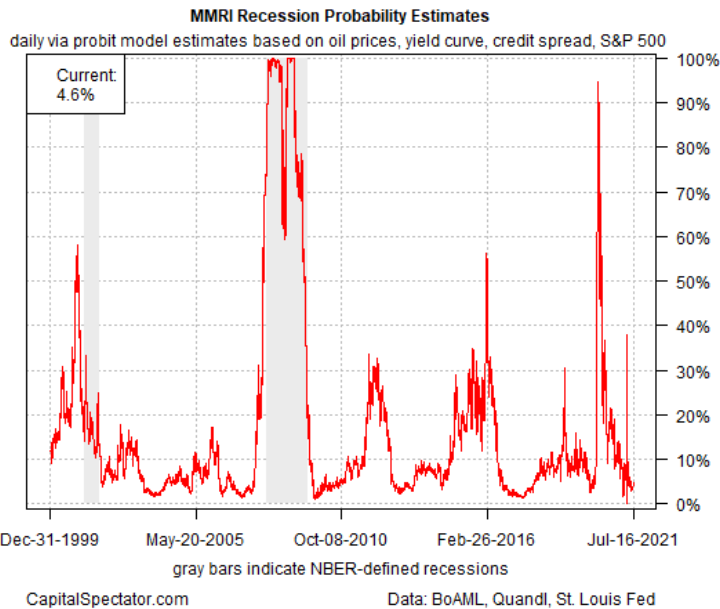
The Macro-Markets Risk Index (MMRI) is designed as a real-time proxy for business-cycle risk based on four data sets:

- **US stocks** (S&P 500), 252-trading day % change
- **High yield credit spread** (BoFA ML US High Yield Master II Option-Adjusted Spread) inverted 252-trading day % change
- **Treasury yield curve** (10-yr Treasury yield less 3-month T-bill yield)
- **Oil prices** (US benchmark: WTI) inverted 252-trading day % change

Analyzing the market-price components of ETI and EMI separately offers a real-time approximation of macro conditions, according to the “wisdom of the crowd.”

Why look to the financial and commodity markets for insight into the economic trend? Timely signals. Conventional economic reports are published with a time lag. This analysis is intended for use as a supplement for developing real-time perspective until a complete data set is published for updating the monthly economic profile.

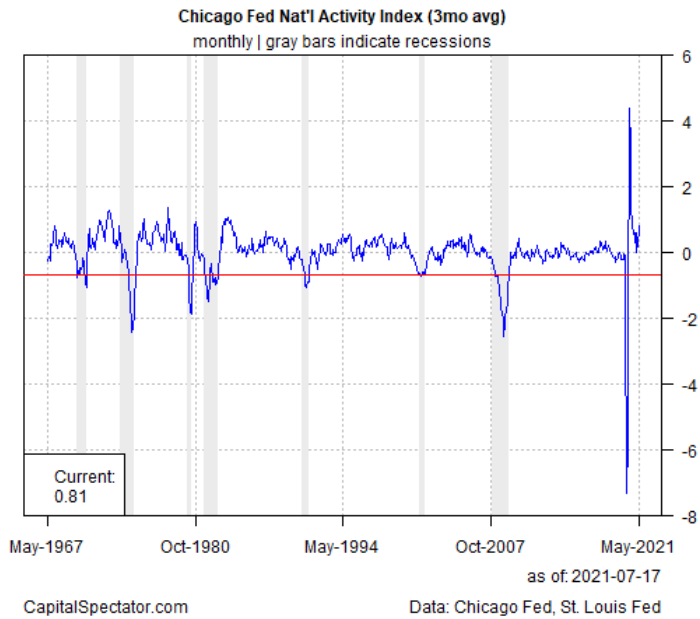
Recession risk probability: MMRI



A decline below 0% in MMRI (horizontal blue line in to chart at left) indicates that recession risk is elevated while readings above 0% imply that the economy will expand in the near-term future.

A probit model translates MMRI’s values into recession-risk probabilities on a daily basis by comparing the index with the historical record of NBER’s recession dates.

Chicago Fed Nat'l Activity Index



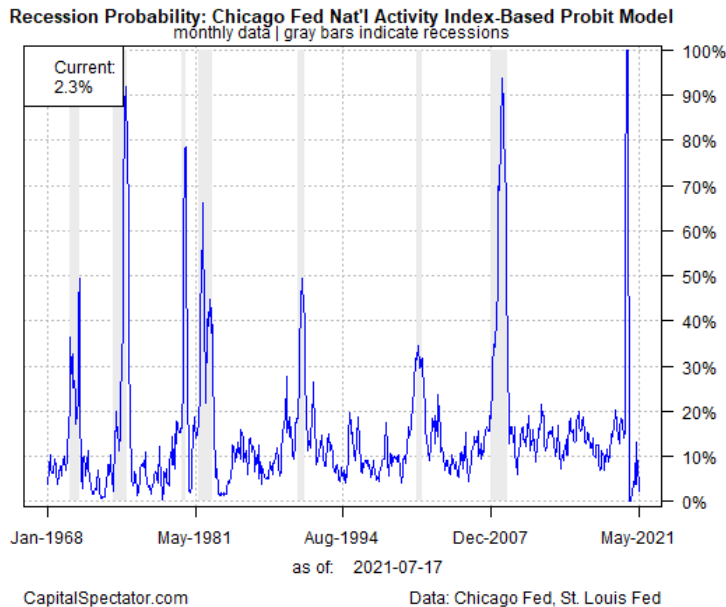
The Chicago Fed National Activity Index is a weighted average of 85 existing monthly indicators of national economic activity. It is constructed to have an average value of zero and a standard deviation of one. Since economic activity tends toward trend growth rate over time, a positive index reading corresponds to growth above trend and a negative index reading corresponds to growth below trend.

When the three-month moving average of the index (CFNAI-MA3) moves below -0.70 (horizontal red line in top chart to left) following a period of economic expansion, there is an increasing likelihood that a recession has begun. Conversely, when the CFNAI-MA3 value moves above -0.70 following a period of economic contraction, there is an increasing likelihood that a recession has ended.

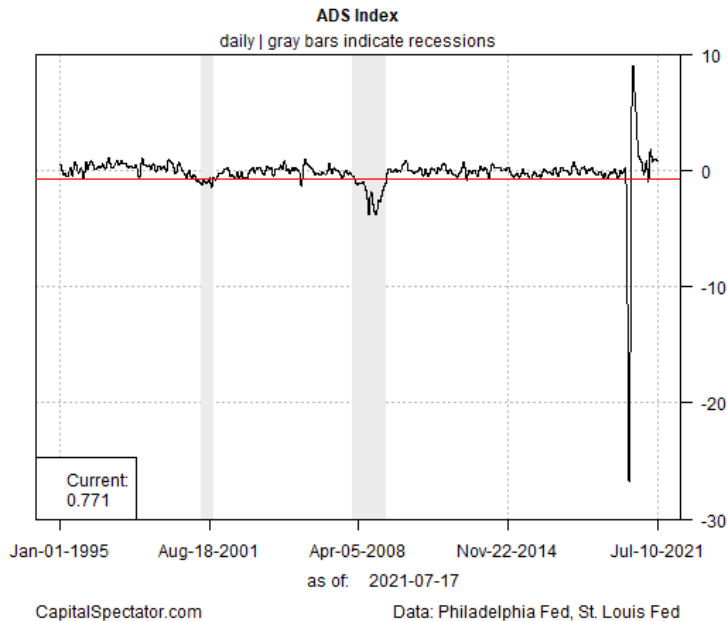
For additional information, see the Chicago Federal Reserve's web site: www.chicagofed.org

A probit model translates CFNAI-MA3 values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: Chicago Fed Nat'l Activity Index



ADS Business Conditions Index



The Aruoba-Diebold-Scotti (ADS) Business Conditions Index is designed to track real business conditions at high frequency. Its underlying (seasonally adjusted) economic indicators (weekly initial jobless claims; monthly payroll employment, industrial production, personal income less transfer payments, manufacturing and trade sales; and quarterly real GDP) blend high- and low-frequency information and stock and flow data. The ADS Index is updated as data on the underlying components are released.

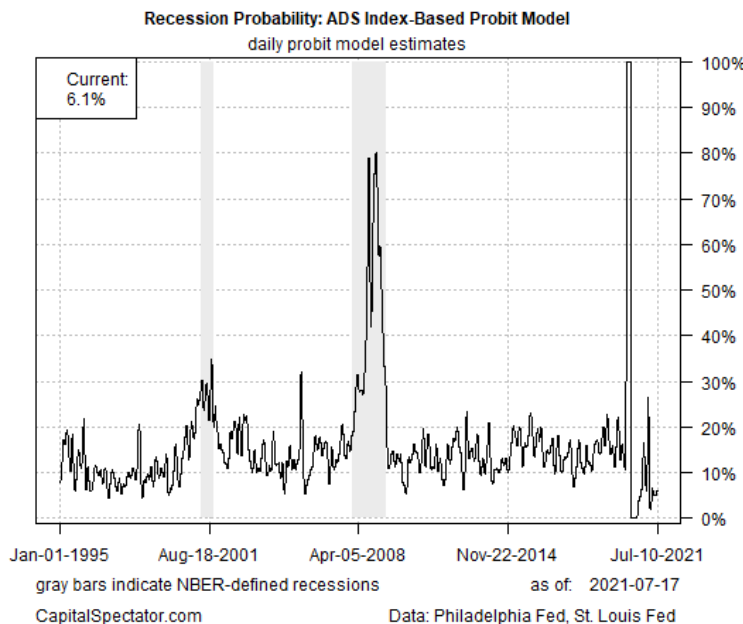
The average value of the ADS index is zero. Progressively bigger positive values indicate progressively better-than-average conditions, whereas progressively more negative values indicate progressively worse-than-average conditions. A value of -3.0, for example, would indicate business conditions significantly worse than at any time in either the 1990-91 or the 2001 recession, during which the ADS index never dropped below -2.0.

Analysis by the San Francisco Fed advises that the “optimal recession threshold” for the ADS Index is -0.80, indicated by the horizontal red line in the top chart at left. For details on this analysis, see: “Diagnosing Recessions” by Óscar Jordà in the Federal Reserve Bank of San Francisco Economic Letter (Feb. 10, 2010) at: www.frbsf.org

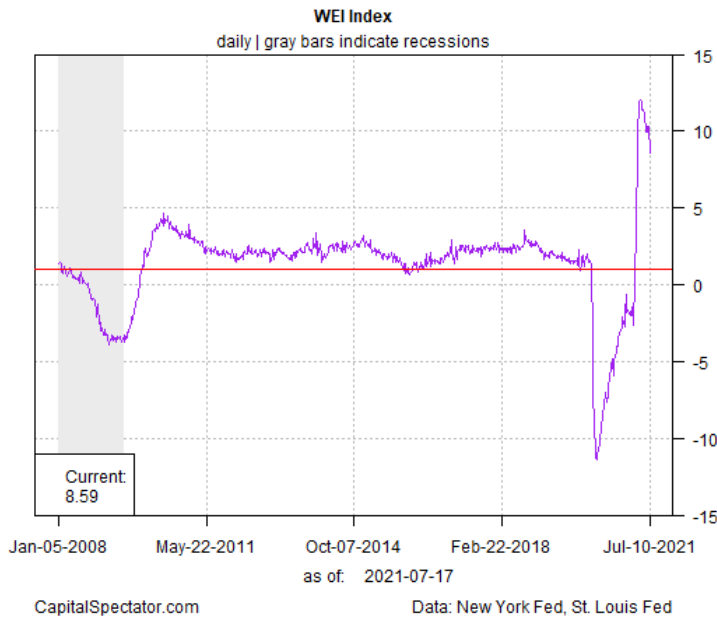
For additional information about the ADS Index, see the Philadelphia Federal Reserve’s web site: www.philadelphiafed.org

A probit model translates ADS Index values into recession-risk probabilities on a daily basis by comparing the index with the historical record of NBER’s recession dates.

Recession risk probability: ADS Business Conditions Index



Weekly Economic Index



The Weekly Economic Index (WEI) tracks real economic activity at a relatively high frequency. It's comprised of ten daily and weekly series covering consumer behavior, the labor market, and production.

The index's design was inspired by research published in 2013 by the Council of Economic Advisers: [bit.ly/2VD05Oc](https://www.whitehouse.gov/the-press-office/2013/02/27/13-02-27-cea-report)

The New York Federal Reserve, which developed and maintains WEI, advises: "The WEI is scaled to the four-quarter GDP growth rate; for example, if the WEI reads -2 percent and the current level of the WEI persists for an entire quarter, we would expect, on average, GDP that quarter to be 2 percent lower than a year previously."

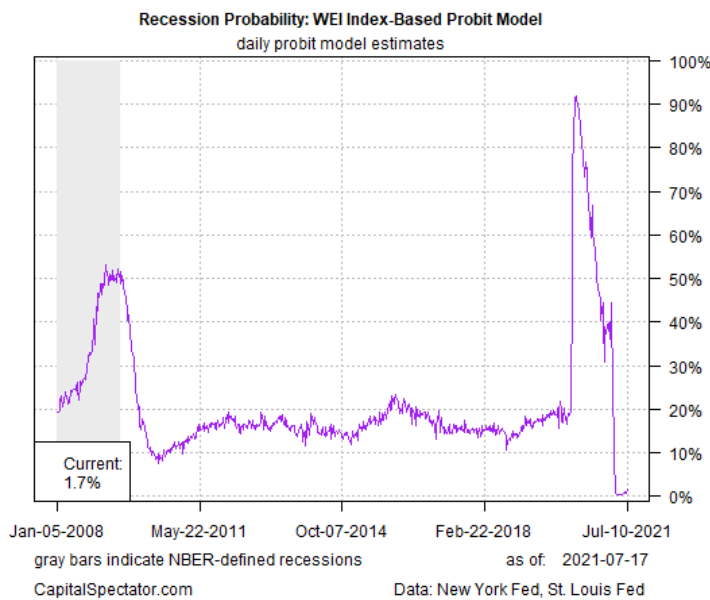
By that standard, WEI values below 1 (red line in top chart) suggest that a recession has started, based on reviewing GDP history since the late-1940s.

For additional information about the ADS Index, see the New York Reserve's web site:

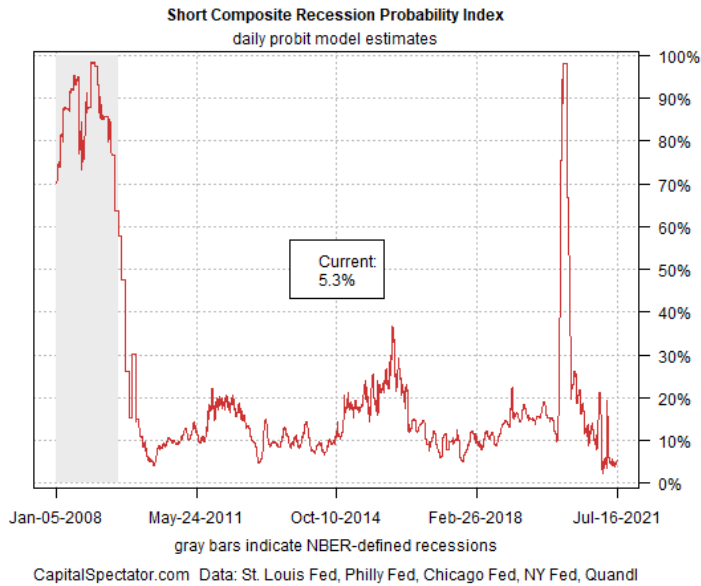
[nyfed.org/35gnb01](https://www.nyfed.org/35gnb01)

A probit model translates WEI values into recession-risk probabilities by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: WEI Index



Recession risk probability: Short CRPI



The Short Composite Recession Probability Index (CRPI) reflects the median recession probability via probit modeling of the following indexes:

1. ADS Index: (p. 6)
2. CFNAI (monthly) (p. 5)
3. Weekly Economic Index (p. 8)
4. MMRI (p. 4)
5. ETI (monthly) (pp 2-3)
6. EMI (monthly) (pp 2-3)

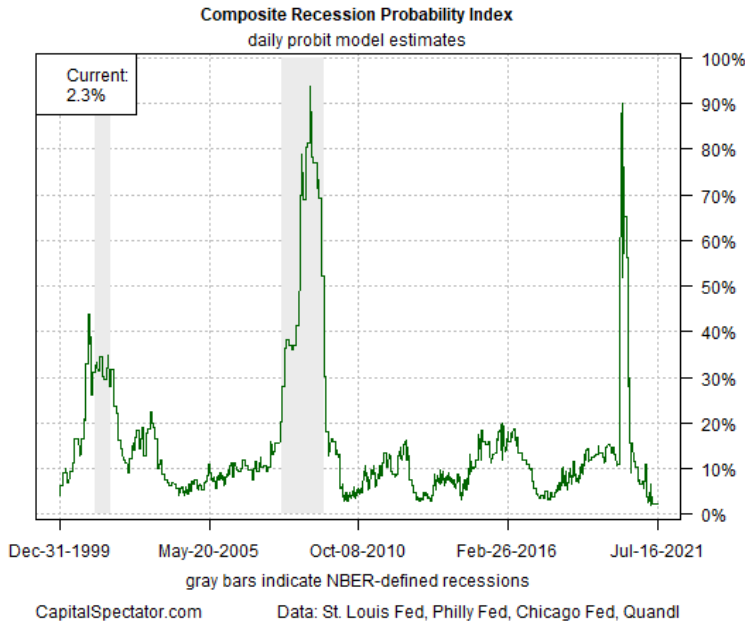
Short CRPI is designed as robust measure of US recession risk that's expected to benefit from the advantages of combining forecasts/nowcasts. The literature is long and deep in this niche, starting with "The combination of forecasts" by J. Bates and C.W.J. Granger in *Operations Research Quarterly*, 20:451-468, 1969.

In contrast with the standard CRPI (p. 9), which is designed to estimate recession risk probability during the onset of a "normal" business cycle (in contrast with the sharp, sudden arrival of the Covid-19 triggered recession of 2020), the Short CRPI react quickly to shifting economic conditions.

Overall, combining forecasts/nowcasts typically delivers more reliable signals by reducing dependence on any one model. That's because every model is flawed in some degree. Combining the forecasts/nowcasts based on models with different assumptions, parameters, and inputs is a reasonably reliable methodology for improving output accuracy relative to any one forecast/nowcast from a single model.

For details on the literature, see "Combining forecasts: A review and annotated bibliography" by Robert T. Clemen (*Journal of Forecasting*, 5(4):559-583, 1989) and "Forecast combinations" by Allan Timmermann (*Handbook of Economic Forecasting*, 1:135-196, 2006).

Recession risk probability: CRPI



The Composite Recession Probability Index (CRPI) reflects the median recession probability via probit modeling of the following indexes:

1. ETI (pp. 2-3)
2. EMI (pp. 2-3)
3. MMRI (p. 4)
4. CFNAI (p. 5)
5. ADS Index (p. 6)

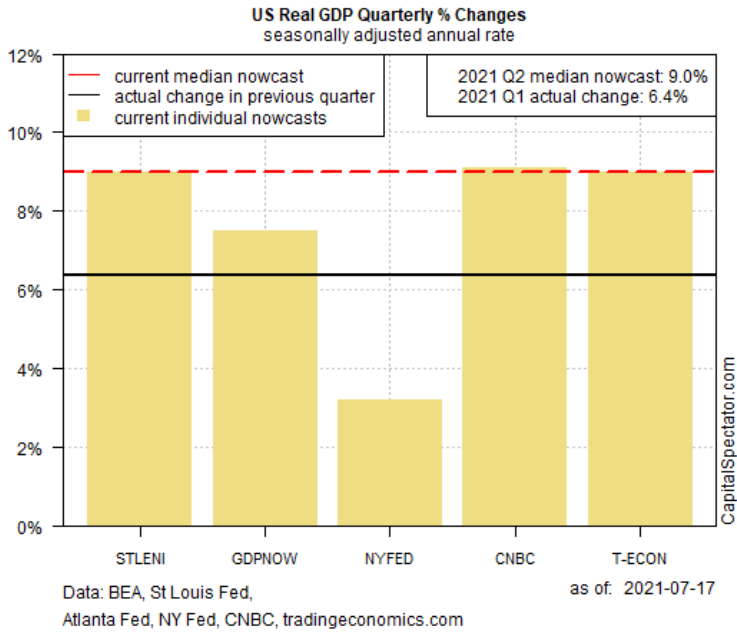
CRPI is designed as robust measure of US recession risk that's expected to benefit from the advantages of combining forecasts/nowcasts. The literature is long and deep in this niche, starting with "The combination of forecasts" by J. Bates and C.W.J. Granger in Operations Research Quarterly, 20:451-468, 1969.

In contrast with the Short CRPI (p. 9), which is designed to react quickly to shifting economic conditions, the standard CRPI presented here is expected to provide a more reliable estimate of recession risk during "normal" business cycles, i.e., the onset of recessions that arise organically from standard macro and financial factors that prevailed prior to the Covid-19 triggered recession in 2020.

The main takeaway: combining forecasts/nowcasts typically delivers more reliable signals by reducing dependence on any one model. That's because every model is flawed in some degree. Combining the forecasts/nowcasts based on models with different assumptions, parameters, and inputs is a reasonably reliable methodology for improving output accuracy relative to any one forecast/nowcast from a single model.

For details on the literature, see "Combining forecasts: A review and annotated bibliography" by Robert T. Clemen (Journal of Forecasting, 5(4):559/583, 1989) and "Forecast combinations" by Allan Timmermann (Handbook of Economic Forecasting, 1:135-196, 2006).

Gross Domestic Product Forecasts



The chart at left summarizes several estimates of the quarterly % change for the next GDP report. For context, the current reported GDP % change for the previous quarter is shown, as calculated by the US Bureau of Economic Analysis (solid black line).

The GDP data doesn't formally factor into the econometric recession-risk estimates for BCRR; rather, the GDP profiling is presented for additional context for assessing the near-term outlook for economic activity.

The current projection reflects the median estimate of the following eight models based on the latest revisions:

STLENI: St. Louis Fed's Economic News Index, which projects the GDP growth rate for the upcoming report. For details, see: fred.stlouisfed.org

GDPNOW: a nowcast model developed by the Atlanta Fed. For details, see: frbatlanta.org

NYFED: A nowcast model developed by the New York Fed. For details, see: newyorkfed.org

CNBC: The median estimate of Wall Street analysts via CNBC. For details, see: cnbc.com

T-ECON: An econometric estimate. For details, see: tradingeconomics.com

The median of the nowcasts, supplied by different sources, each using a different methodology, is expected to deliver a relatively robust estimate of the upcoming GDP report by way of combining projections.¹

¹ See p. 7 for references on the academic literature related to combining forecasts.

ETI and EMI Component Indicators

US Economic Profile						
July 18, 2021						
	Indicator	Transformation	Apr-21	May-21	Jun-21	Jul-21
1	Labor Market Index ¹	1 yr % change	71.1%	62.6%	46.5%	NA
1a	Private non-farm payrolls	1 yr % change	13.3%	10.4%	6.4%	NA
1b	Initial Jobless Claims ²	1 yr % chg (inverted)	86.7%	79.3%	73.3%	73.1%
1c	Employ-to-Unemploy. Ratio	1 yr % change	167.0%	148.8%	99.1%	NA
1d	Index of Agg. Weekly Hours ³	1 yr % change	17.4%	12.0%	7.4%	NA
2	US Stock Market (S&P 500) ²	1 yr % change	49.9%	42.8%	36.5%	35.7%
3	Real personal income ex current transfer receipts	1 yr % change	9.2%	7.8%	NA	NA
4	ISM Manufacturing Index	% +/- neutral: 50 ⁵	21.4%	22.4%	21.2%	NA
5	Spot Oil (W. Tex. Intermed.) ²	1 yr % chg (inverted)	-273.0%	-128.2%	-86.3%	-81.9%
6	Consumer Spending Index ⁵	1 yr % change	36.0%	18.0%	12.0%	NA
6a	Real Pers. Cons. Expend.	1 yr % change	24.7%	14.5%	NA	NA
6b	Real Retail Sales	1 yr % change	47.3%	21.6%	12.0%	NA
7	Treasury Yield Curve (10 yr Note less 3 mo T-bill) ²	current monthly spread ⁷	16.2%	16.0%	14.8%	NA
8	High-Yield Bond Spread (BoFA ML US HY Option-Adjusted Spread) ⁹	1 yr % chg (inverted)	59.8%	54.3%	47.7%	46.2%
9	Real Monetary Base (M0)	1 yr % change	19.7%	11.8%	NA	NA
10	University of Michigan Consumer Sentiment Index	1 yr % change	23.0%	14.7%	9.5%	11.4%
11	Industrial Production	1 yr % change	17.5%	16.1%	9.8%	NA
12	New Residential Bldg. Permits	1 yr % change	58.4%	35.1%	NA	NA
13	Real Mfg. & Trade Sales ⁸	1 yr % change	16.7%	NA	NA	NA
14	ISM Non-Mfg. Index ⁴	% +/- neutral: 50 ⁵	25.4%	28.0%	20.2%	NA

1. Average 1-year % changes of payrolls, jobless claims, employed-to-unemployed ratio, and weekly hours index.

2. Average monthly data based on daily closes.

3. Production and Nonsupervisory Employees: Total Private Industries.

4. Data series begins Jan. 2008.

5. A neutral reading is assumed to be 50. The transformation is calculated as the % deviation for each monthly reading relative to 50.

6. Average of 1-year % changes for real personal consumption expenditures & real retail sales.

7. Monthly difference: 10yr less 3mo % rates, multiplied by 10.

8. Manufacturing & w wholesale sales via BEA. Note: retail sales excluded.

9. Average monthly data. Moody's BAA-AAA spread through Nov-1997, HY spread data thereafter.

Note: The Labor Market Index is considered as 1 indicator, comprised of the four indicators in green cells. The same applies to the Consumer Spending Index, which is comprised of 2 indicators.

NA = data not yet available from source

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The Economic Trend & Momentum indexes are aggregates of 14 economic and financial indicators, as shown in the table at left. A complete data set for each month tends to lag by one to three months, depending on the indicator. Manufacturing and trade sales suffer the longest lag. By contrast, the market figures are available in real time.

To calculate ETI and EMI in the graphs and analysis above, missing data points must be estimated. To fill in the missing data points, an ARIMA model is used.

Standard Methodology Parameter Rules for Summary Table on Page 1:

<i>Business Cycle Index Values</i>							GDP Nowcast
		ETI	EMI	MMRI	CFNAI	ADS	
	low risk	>80%:100%	> 5%	> 5%	> 0.2	> 0.2	> +3.5%
	medium-low risk	55%:80%	1%:5%	0%:5%	-0.2:+0.2	-0.2:+0.2	+1.5%:+3.5%
	medium-high risk	45%: < 55%	-1%: < 1%	-5%: < 0%	-0.7: < -0.2	-0.8: < -0.2	0%:<+1.5%
	high risk	< 45%	< -1%	< -5%	< -0.7	< -0.8	<0%

<i>Recession Risk Probability Estimates</i>							
		ETI	EMI	MMRI	CFNAI	ADS	CRPI
	low risk	0%:10%					
	medium-low risk	> 10%:30%					
	medium-high risk	> 30%:50%					
	high risk	> 50%					

Short-Focus Methodology Parameter Rules for Summary Table on Page 1:

<i>Business Cycle Index Values</i>							
		WEI weekly	ETI monthly	EMI monthly	MMRI	CFNAI monthly	ADS
	low risk	>3	>80%:100%	> 5%	> 5%	> 0.2	> 0.2
	medium-low risk	2:3	55%:80%	1%:5%	0%:5%	-0.2:+0.2	-0.2:+0.2
	medium-high risk	1:2	45%: < 55%	-1%: < 1%	-5%: < 0%	-0.7: < -0.2	-0.8: < -0.2
	high risk	<1	< 45%	< -1%	< -5%	< -0.7	< -0.8

<i>Recession Risk Probability Estimates</i>								
		WEI weekly	ETI	EMI	MMRI	CFNAI	ADS	CRPI
	low risk	0%:10%						
	medium-low risk	> 10%:30%						
	medium-high risk	> 30%:50%						
	high risk	> 50%						