

Predicting the Near Term State of the U.S. Economy Using Composite Leading Indicators

- The Composite Leading Indicators (CLI) is designed to optimize the predictability of the state of the U.S. economy in the near future. This index was restructured in 1996 by its developer, the Conference Board, to improve its forecasting ability. The prediction of this index, however, is not obvious and it requires a decision rule for interpretation.
- In this meeting the presenter will briefly describe the application of a Bayesian method he developed for estimating probability forecast of a down turn in the U.S. economy. He will present the nature of the major changes done to this index in 1996 and will examine the Conference Board's claim of its performance improvement. The application to the current state of the economy (Recession?) will also be presented.
- This presentation should help the audience to set their confidence for a prediction of CLI.

Opening Statement

- Current State of the U.S. Economy
 - Downturn Forces
 - Upturn Forces
 - Overall State: Uncertain
- Who Makes the Decision?
 - NBER Business Cycle Dating Committee
 - Decision Criteria: Duration, Depth, Diffusion
 - Delayed Decision
- A Timely Decision? Prediction
 - Negative Economic Growth (Real GDP)
 - Composite Leading Indicators
- Interpretation of the Composite Leading Indicators

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Content

- Composite Leading Indicators Components: Pre-1996 versus Post-1996
- Contrast between the Recession and Expansion Probability Distributions: Pre-1996 CLI versus Post-1996 CLI
- Predicting A Downturn: Inference, Decision Rule
- Inference Methodology: Bayesian Probability Forecast of a Downturn
- BPDF2: Bayesian Probability of a Downturn in the U.S. Economy Using 2 Consecutive CLIs: Pre-1996 versus Post-1996
- Performance Evaluation: Pre-1996 CLI versus Post-1996 CLI – Decision Rule
- Are We in a Recession?

**Table 1. Components of the composite leading indicators and their weights:
pre-1996 versus post-1996**

Leading Indicators	Weight - 1996*	Weight - 2001**
Average weekly hours, manufacturing	15.6%	18.3%
Average weekly initial claims for unemployment insurance	1.5%	2.5%
Manufacturers' new orders, consumer goods and materials	3.3%	5.0%
Vendor performance	1.5%	2.8%
- Contracts and orders for plant and equipment	1.2%	0.0%
Building permits, new private housing units	1.2%	1.9%
- Change in manufacturers' unfilled orders, durable goods	15.8%	0.0%
- Change in sensitive materials prices	40.5%	0.0%
Index of stock prices, 500 common stocks	2.3%	3.1%
Money supply M2	15.8%	30.1%
Index of consumer expectations	1.3%	1.8%
+ Interest rate spread, 10-year treasury bonds less federal funds	0.0%	33.2%
+ Manufacturers' new orders for nondefense capital goods and materials	0.0%	1.3%
Total	100.0%	100.0%

* The Conference Board Business Cycle Indicators . February 1996

** The Conference Board Business Cycle Indicators. January 2001: Standardization Factors

About 50% of the weights are shifted from the real economy to the money economy

A timelier composite leading indicators: **current financial indicators** + best estimates of the real economy's indicators =

Leading Indicators

Weight - 2001*

Average weekly hours, manufacturing

18.3%

Average weekly initial claims for unemployment insurance

2.5%

Manufacturers' new orders, consumer goods and materials

5.0%

Vendor performance

2.8%

Building permits, new private housing units

1.9%

Index of stock prices, 500 common stocks

3.1%

Money supply M2

30.1%

Index of consumer expectations

1.8%

Interest rate spread, 10-year treasury bonds less federal funds

33.2%

Manufacturers' new orders for nondefense capital goods and materials

1.3%

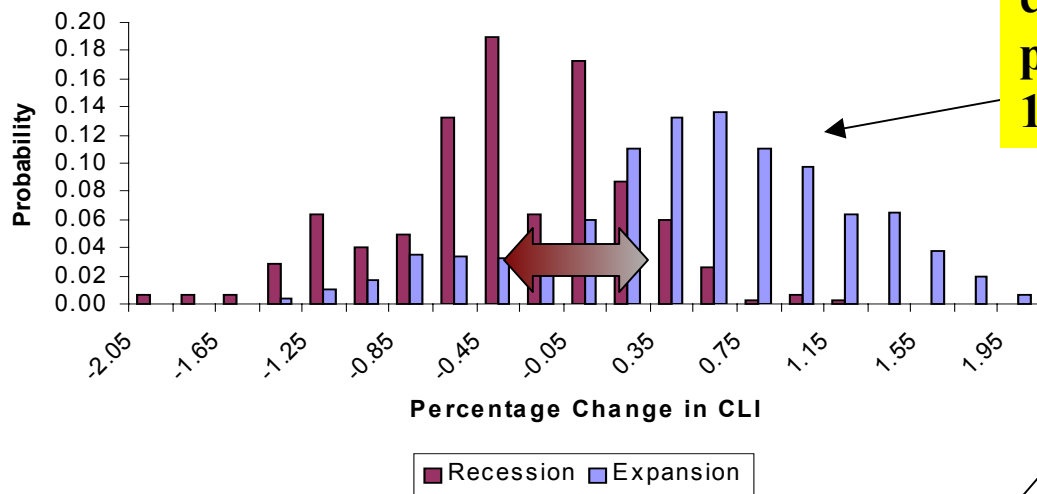
Total

**... about 4 weeks of earlier production of CLI,
with no loss of predictive power.**

100.0%

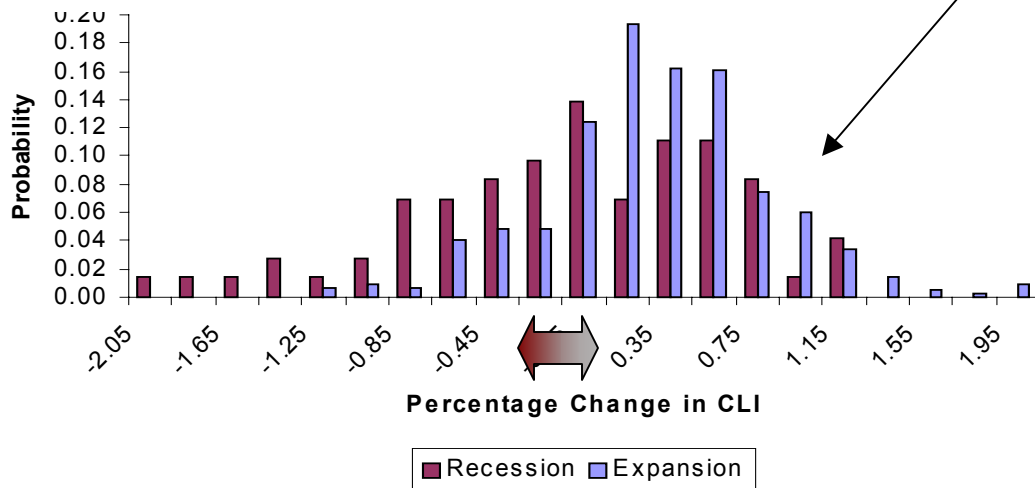
* *The Conference Board Business Cycle Indicators*. January 2001: Standardization Factors

Distributions of Percentage Change in CLI - 1948:1970 - CLI1982 = 100



There is a higher contrast between the recession and expansion distributions of the percentage changes in CLI in pre-1996 than in post-1996

	<u>Recession</u>	<u>Expansion</u>
Mean	-0.375	0.464
Standard Deviation	0.537	0.681
Information Divergence =	2.28	



	<u>Recession</u>	<u>Expansion</u>
Mean	-0.103	0.283
Standard Deviation	0.714	0.520
Information Divergence =	0.72	

Predicting a Downturn – Inference, Decision Rule

- CLI values have good information about the near future state of the U.S. economy, but this information is not obvious
- It requires:
 - Inference: What is the probability of a downturn?
 - Decision Rule: How this inference can be used to reliably predict/ detect a downturn/ recession?

Inference Methodology: Bayesian Probability

Forecast of a Downturn

Likelihood Function of a Downturn (Mostaghimi 1997) :

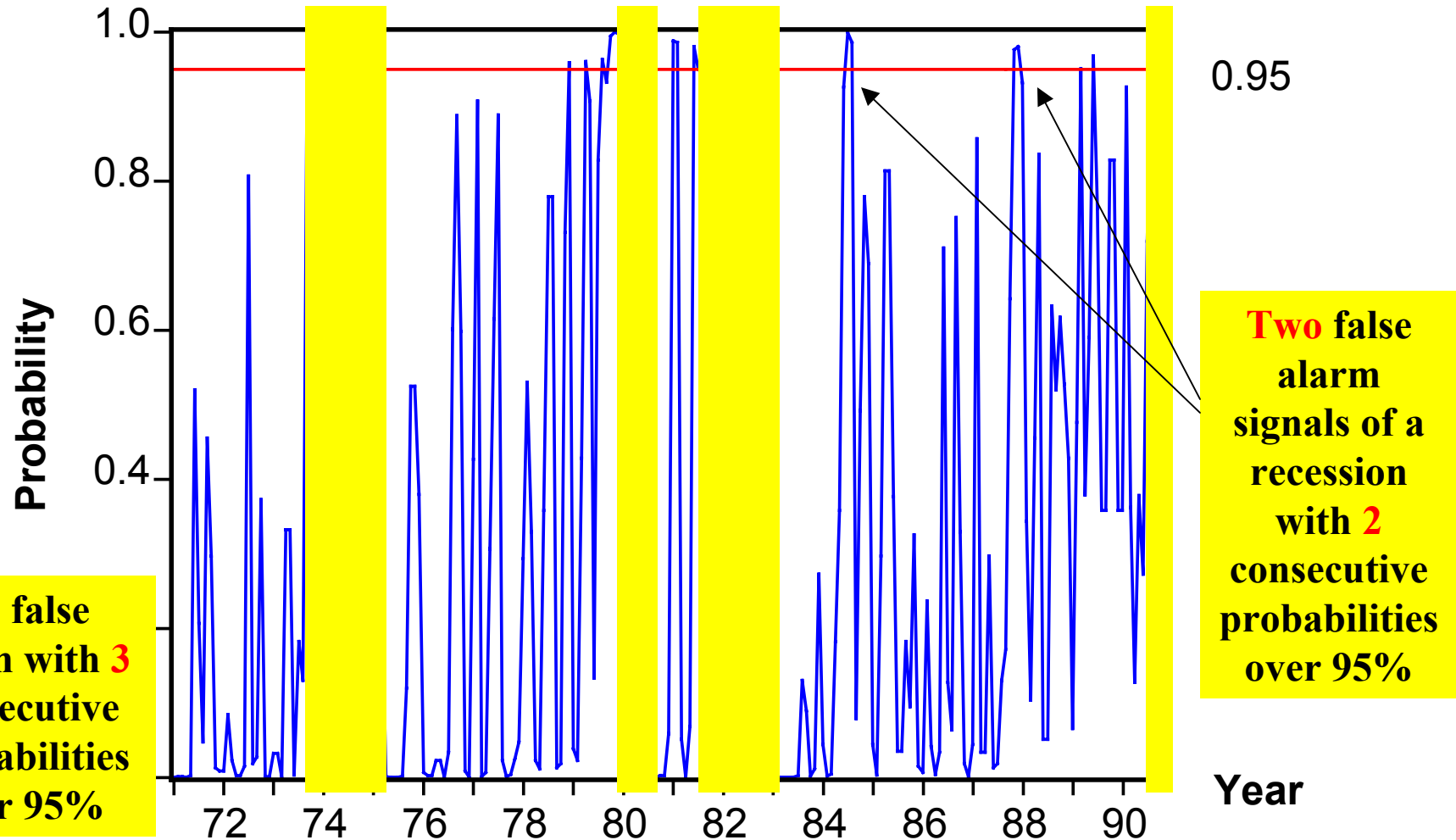
$$Pr_d(\theta_K, \theta_{(K-1)}, \dots, \theta_1 | q_d) \propto \kappa \exp \left\{ \sum_{k=1}^K I_d^k + I_d^{K, (K-1), \dots, 1} \right\}$$

where: **Capable of combining the information of 2 or more CLIs**

- \mathbb{I}_k is the percentage change in CLI observed at time k ,
- $q_d = (q_{d0}, q_{d1}, \dots, q_{dM})$ is the probability mass function of a percentage in CLI during a recession,
- I_d^k is a relative entropy measuring the amount of information in \mathbb{I}_k relative to q_d ,
- $I_d^{K, (K-1), \dots, 1}$ is a measure of the joint information in \mathbb{I}_k ; for $k=1, 2, \dots, K$.

The Methodology is “Event Oriented” as opposed to “Regression Oriented”

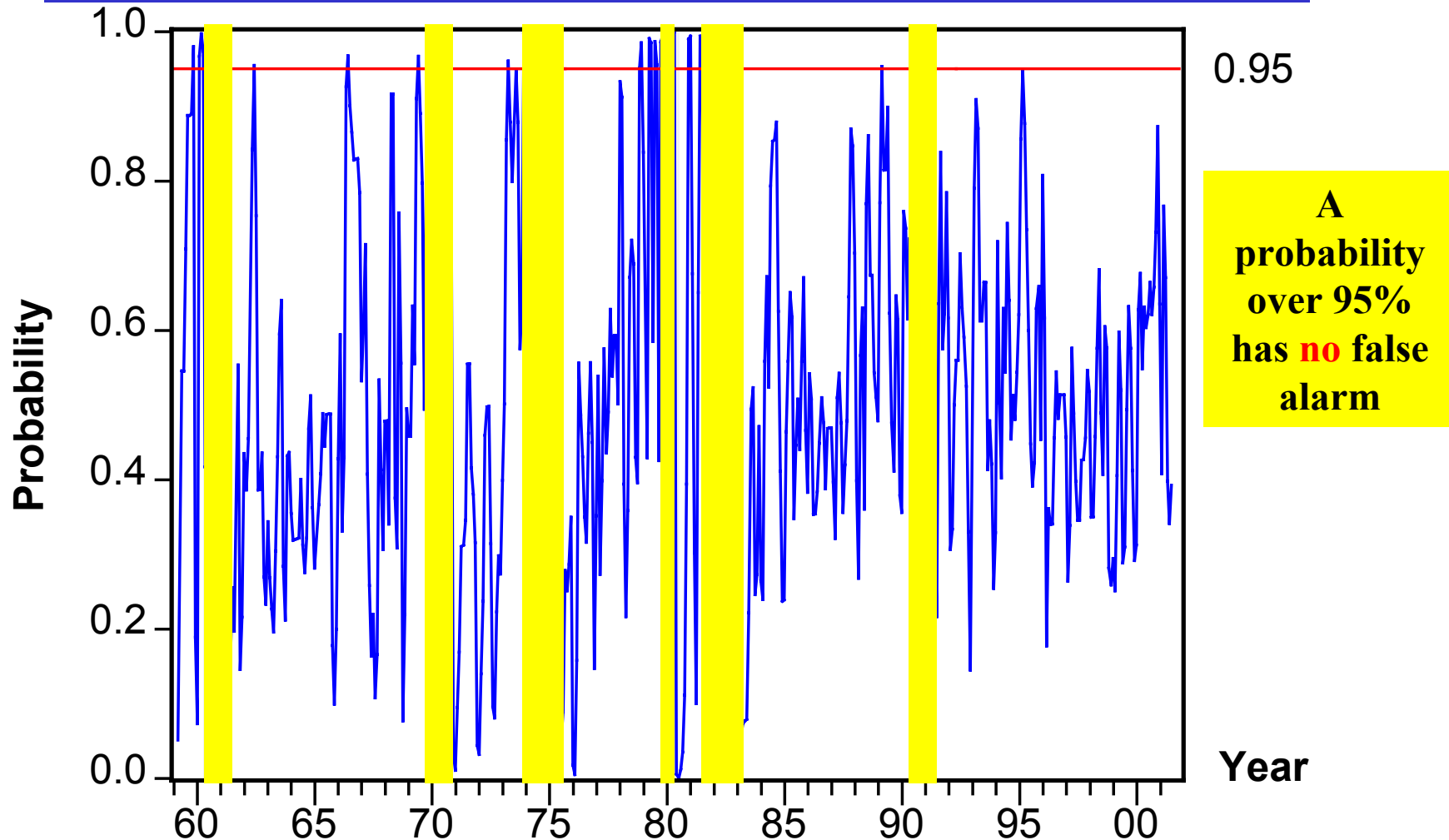
BPF2: Bayesian Probability Forecast of a Downturn Using 2 Consecutive CLI - CLI1982=100



No false alarm with 3 consecutive probabilities over 95%

Two false alarm signals of a recession with 2 consecutive probabilities over 95%

BPF2_1996: Bayesian Probability Forecast of a Downturn Using 2 Consecutive CLI - CLI1996 = 100



**Table 2. Evaluation of BPF2 95% downturn signals,
pre-1996 CLI versus post-1996 CLI: 1973-1990**

NBER Peaks	Pre-1996 CLI			Post-1996 CLI		
	Signal Dates	Lead (-) Lag(+)	NCDS	Signal Dates	Lead (-) Lag(+)	NCDS
73/11	73/09	-1	2	73/12	+1	2
	73/12	+1	1	74/04	+5	10
	74/04	+5	11			
80/01	79/08	-5	5	78/11	-14	2
	80/03	+2	3	79/04	-10	2
				79/07	-6	2
				79/10	-3	2
				80/03	+2	3
81/07	81/01	-6	2	80/12	-7	2
	81/06	-1	7	81/06	-1	2
				81/10	+3	1
	84/07	-	2			
	87/11	-	2			
90/07	89/06	-13	1	89/03	-16	1
	90/08	+2	4	90/09	+2	3

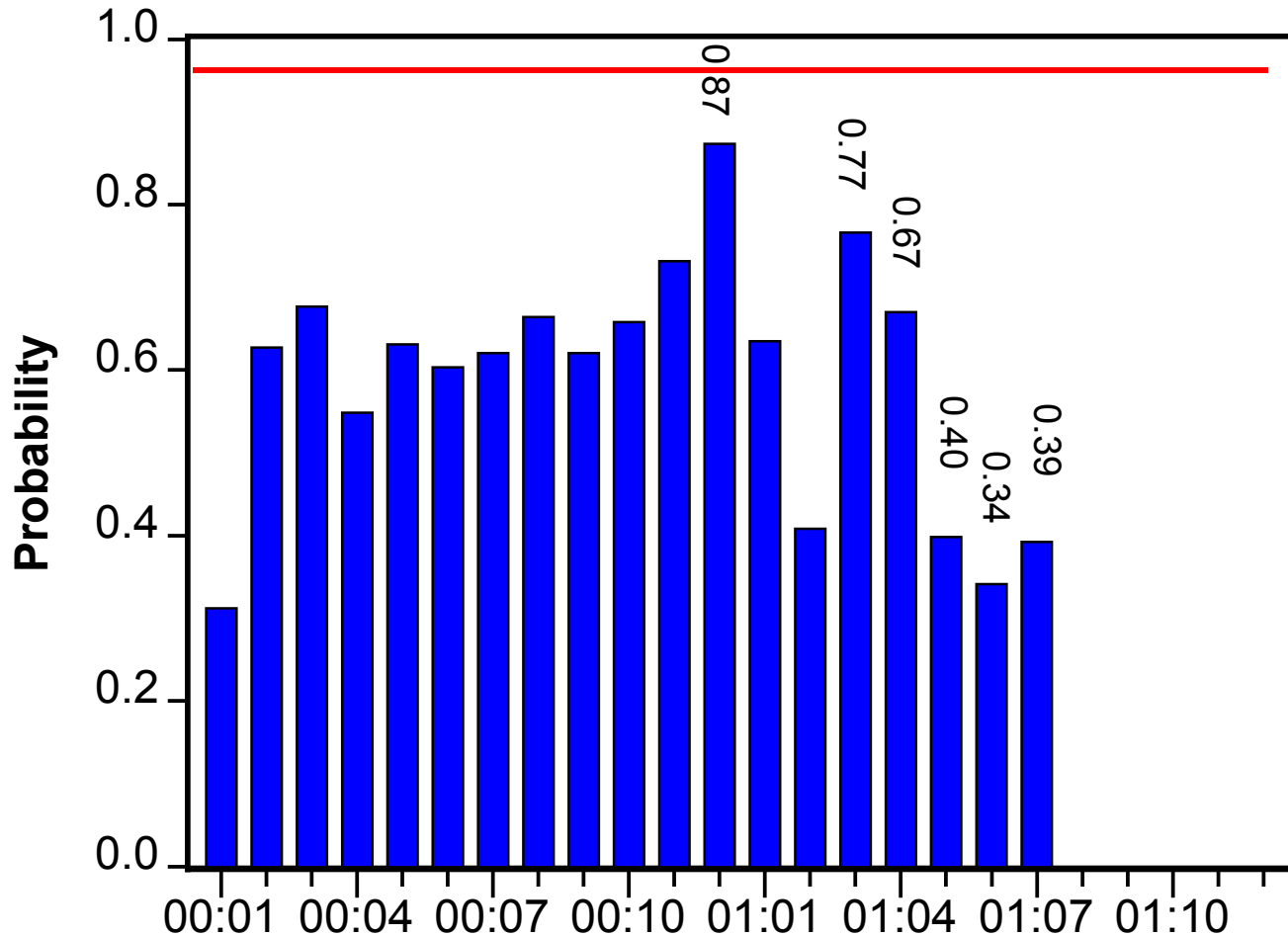
Pre-1996

A min. of **4** consecutive CLI values can detect/predict a recession, no false alarm

Post-1996

A min. of **2** consecutive CLI values can detect/predict a recession, no false alarm

Recession in the Near Future? BPDFD2 Says No!



... unless we are already in a recession and it will be detected with a lag time!

Year: Month

How Well Are CLIs Predicting the Near Future State Of the Economy?

