

Real Time Analysis of the U.S. Business Cycle

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Outline

- Models and Data
- Real Time Analysis: Motivation and Procedure
- Results - The Past 6 Recessions
- Conclusions

Models and Data

- Univariate Markov Switching Model (MS):
 - Quarterly GDP (real time unrevised series since 1965:4)
- Dynamic Factor Model with Regime Switching (MSDF)
 - Monthly Data: Industrial Production, Employment on Non-Agricultural Payroll, Manufacturing and Trade Sales, Personal Income Less Transfer Payments

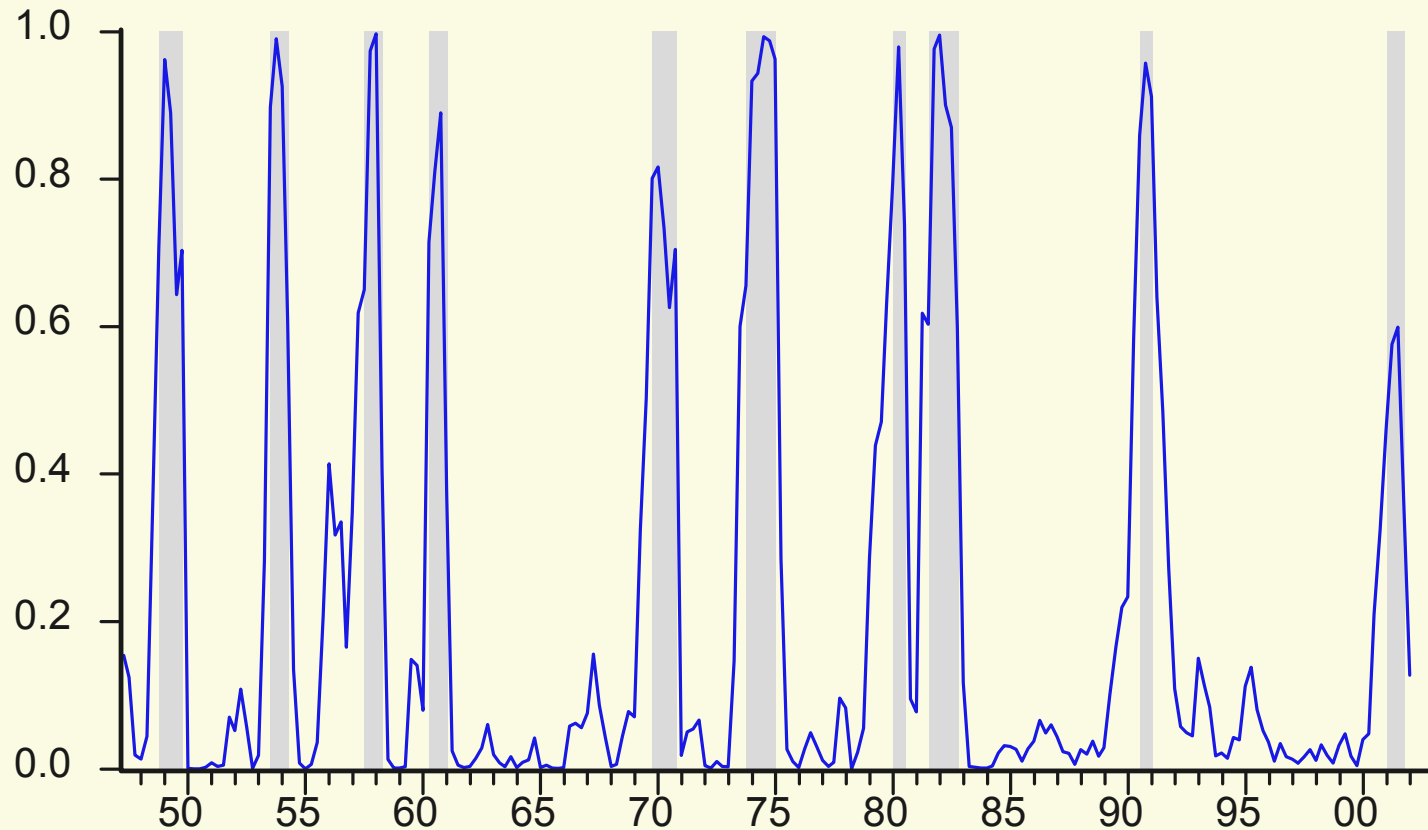
Real Time Analysis I

- **Motivation:** To study how precisely and quickly models would have identified turning points had they been used in real time around past recessions.
- **Goal:** emulate forecasting problem in real time - models are estimated using only information available at each point in time.

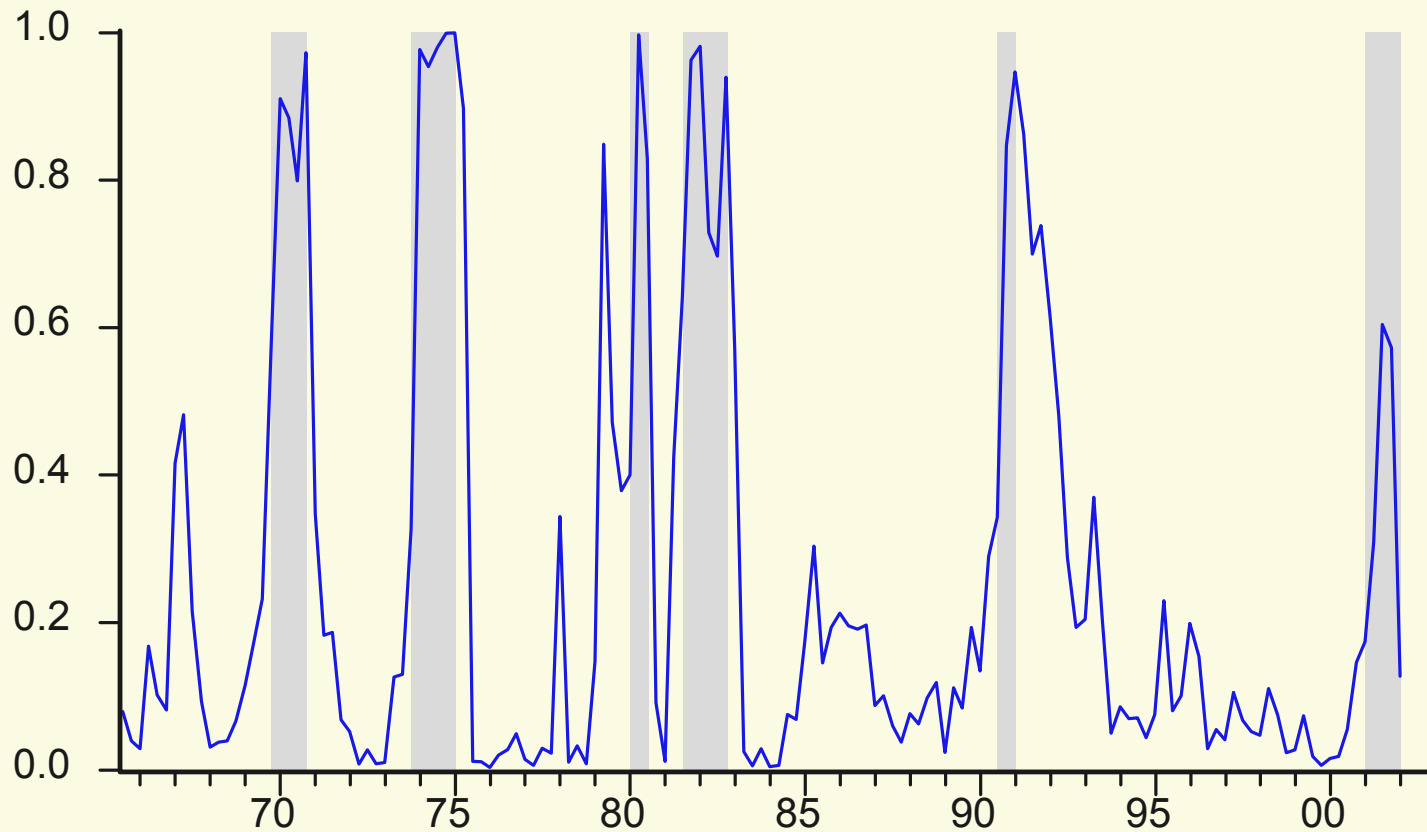
Real Time Analysis II

- **Procedure:** models are estimated recursively using data that would have been available to the econometrician at the end of the sample period considered
 - E.g. in 1990:01 model is estimated using unrevised data available at that time: some monthly series available up to 1989:11.

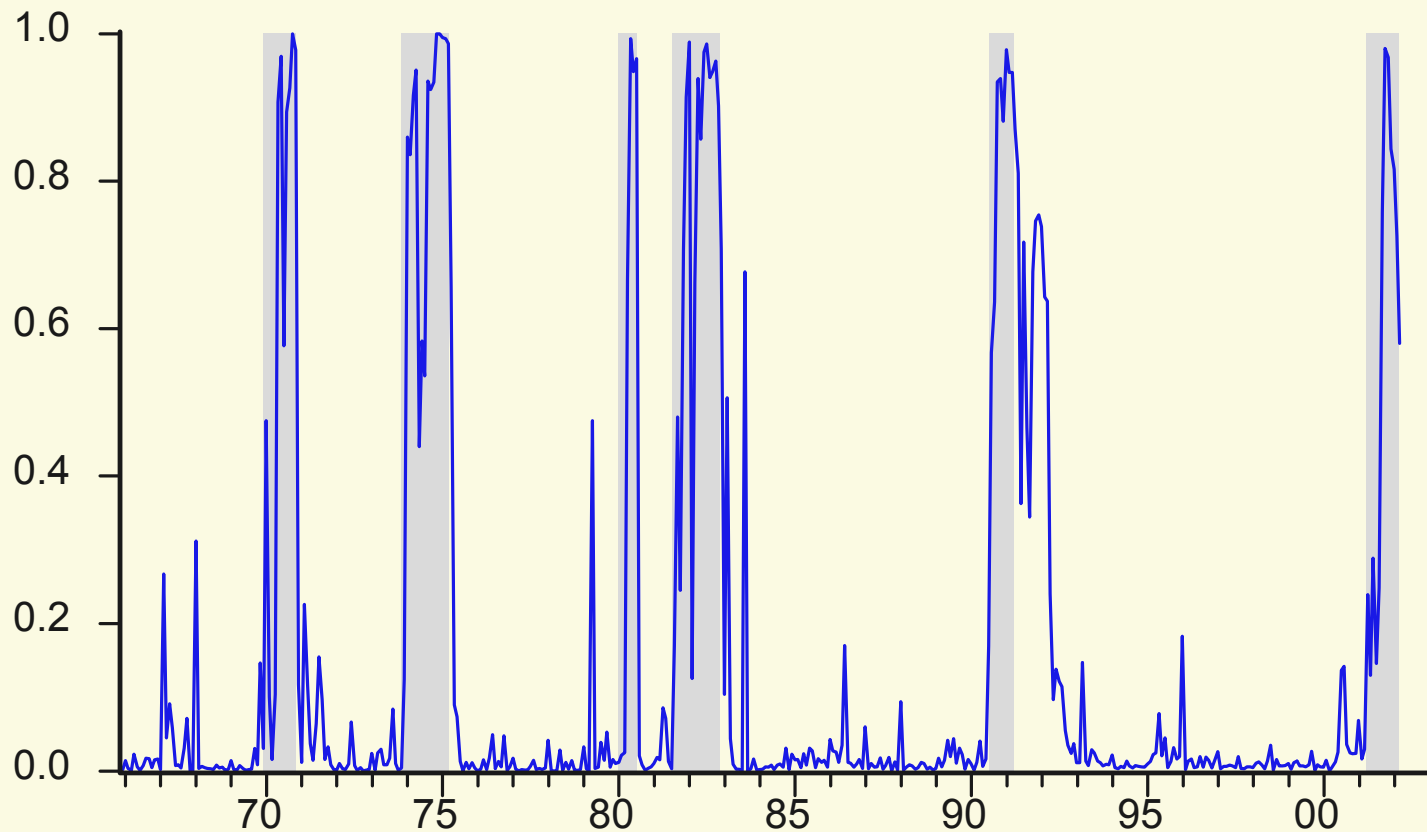
U.S. Business Cycles - Smoothed Probabilities of Recessions



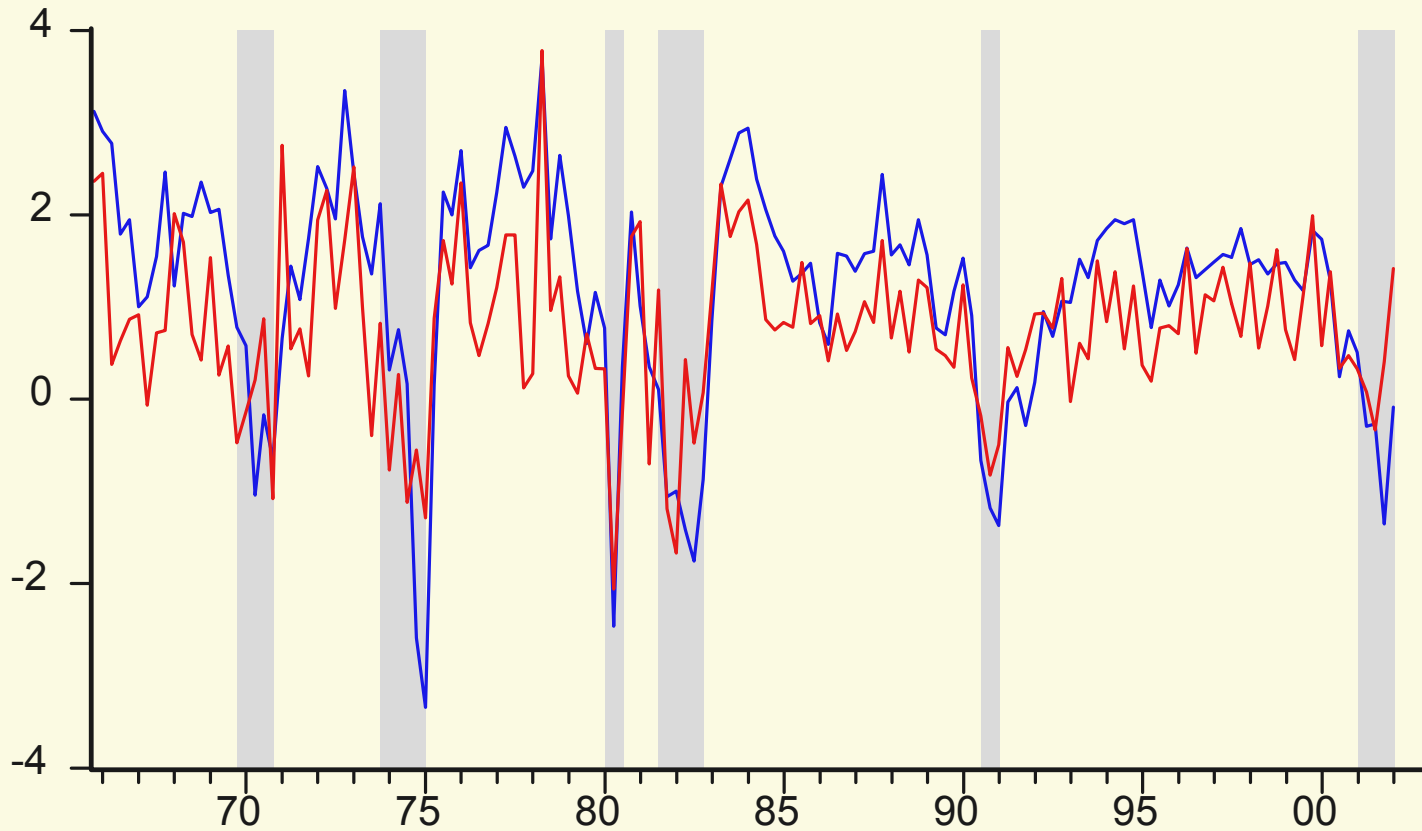
Real Time Probabilities of Recessions - Univariate MS Model



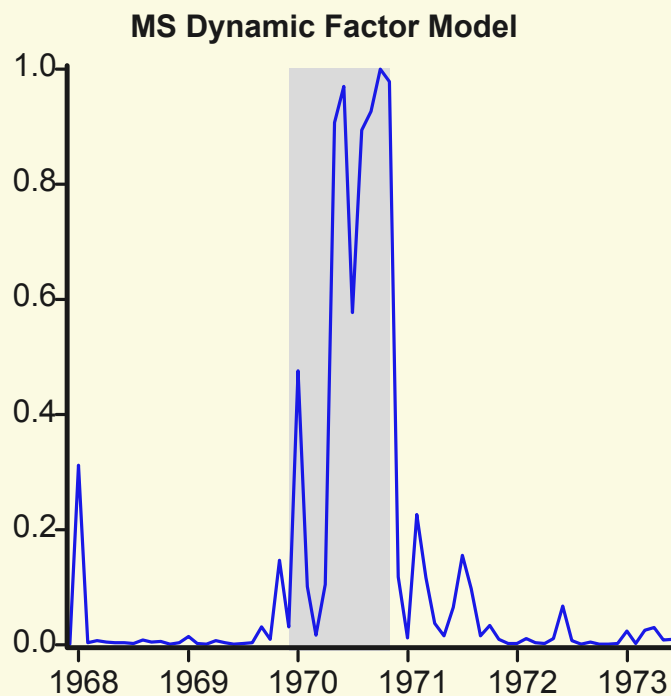
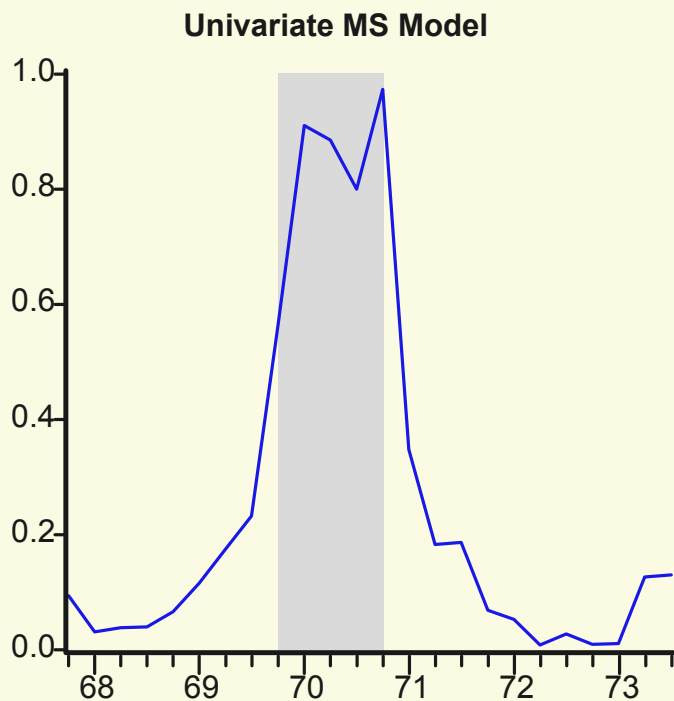
Real Time Probabilities - MS Dynamic Factor Model



Real Time Dynamic Factor (—) and GDP Growth (—)



Real Time Probabilities of the 1969-70 Recession and NBER Dating



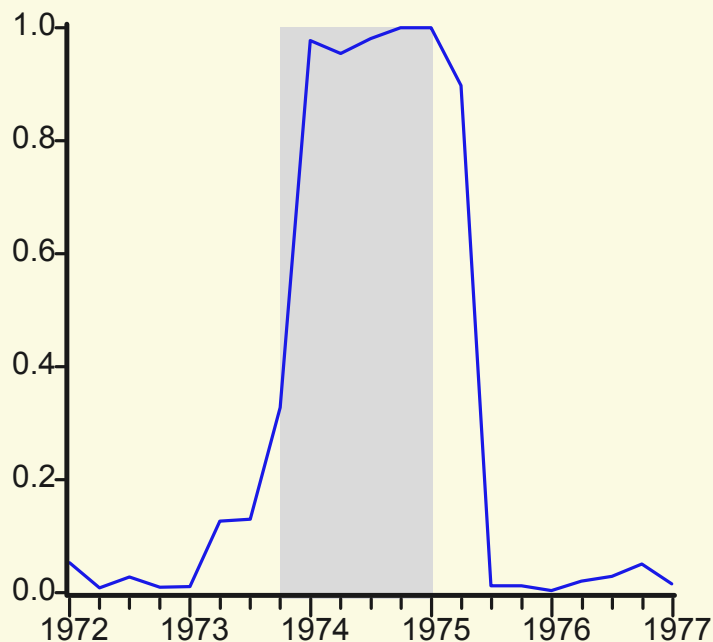
1969-1970 Recession

1969-70 Recession

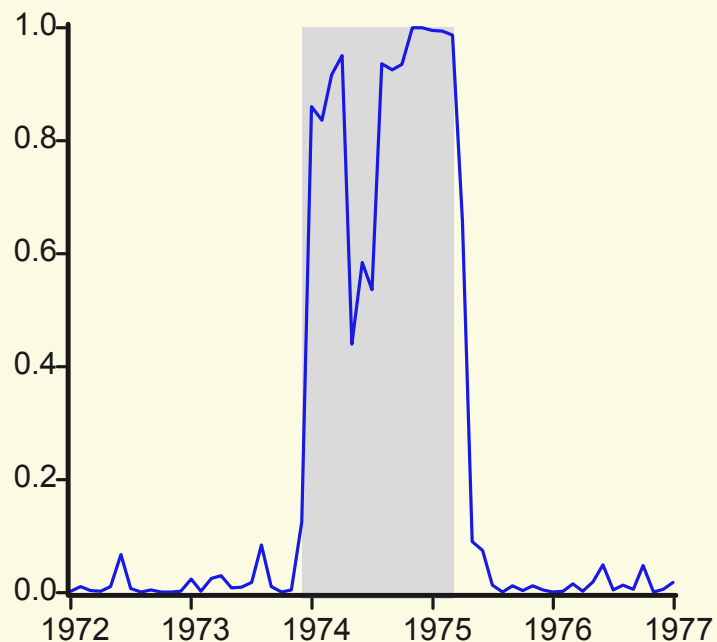
Turning Points	Univariate MS		DFMS		NBER	Announced
Peak	1969:IV	23%→57%	1970:01	3% → 48%	1969:12	-
Trough	1970:IV	97%→35%	1970:11	98%→11%	1970:11	-

Real Time Probabilities of the 1973-75 Recession and NBER Dating

Univariate MS Model



MS Dynamic Factor Model

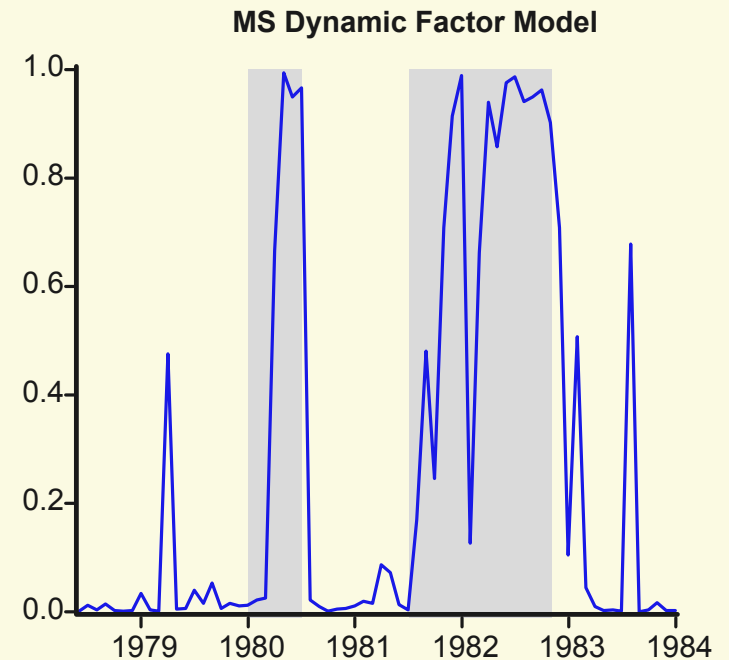
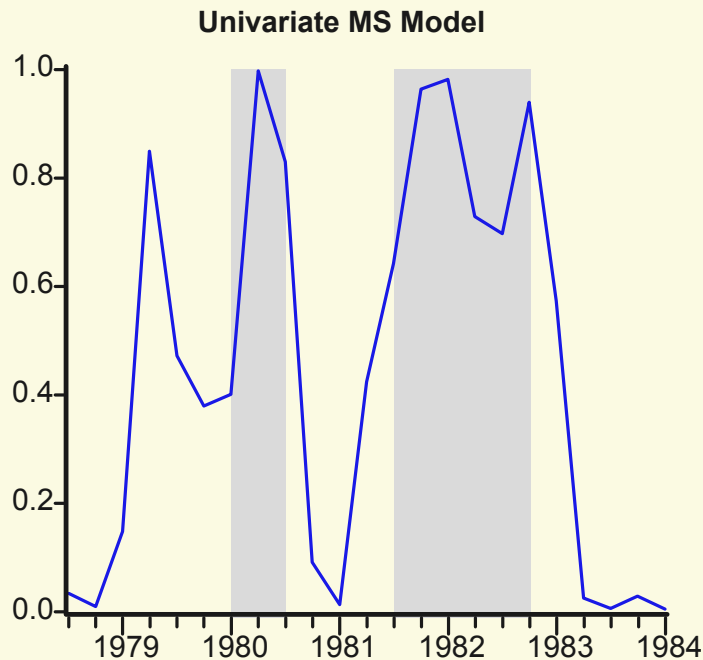


1974-1975 Recession

1974-75 Recession

Turning Points	Univariate MS		DFMS		NBER	Announced
	1974:I	33%→98%	1974:01	12%→86%		
Peak	1974:I	33%→98%	1974:01	12%→86%	1973:12	-
Trough	1975:II	90%→1%	1975:04	66%→9%	1975:03	-

Real Time Probabilities of the 1980 and 1981-82 Recessions and NBER Dating



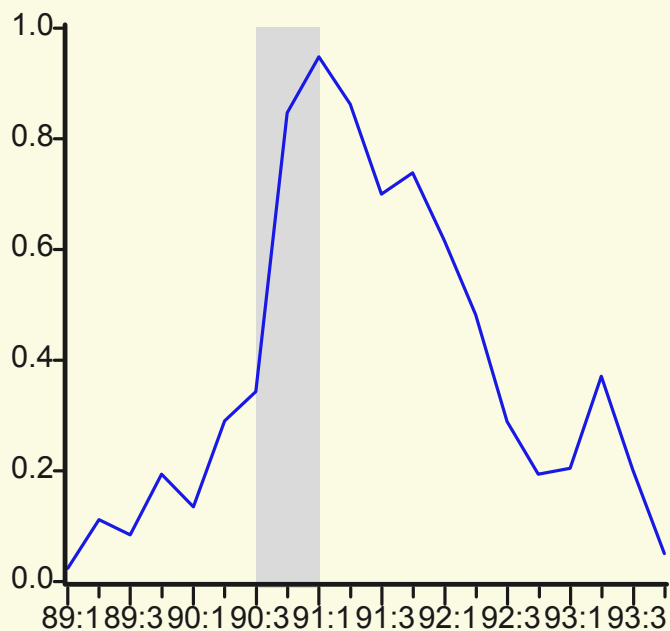
1980-1981 and 1981 Recessions

1980-81 Recession and 1981 Recession

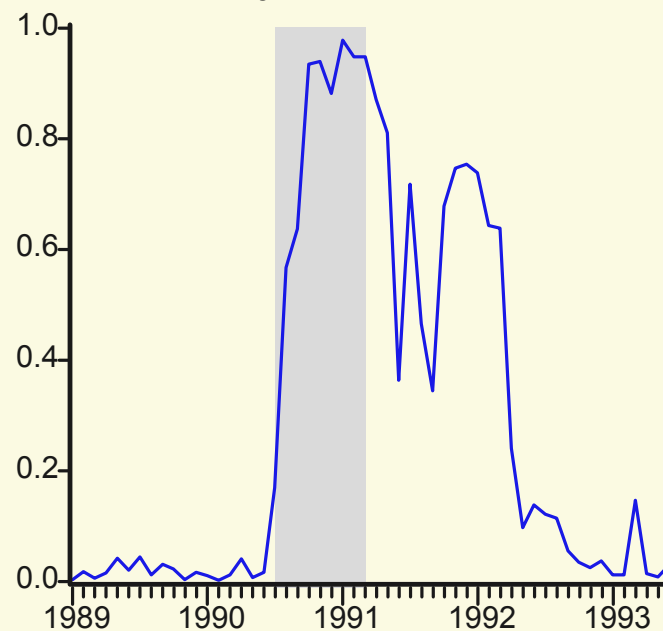
Turning Points	Univariate MS		DFMS		NBER	Announced
Peak	1980:II	40%→99%	1980:04	3%→66%	1980:01	1980:06
Trough	1980:III	83%→9%	1980:07	97%→2%	1980:07	1981:07
Peak	1981:III	42%→64%	1981:09	17%→48%	1981:07	1982:01
Trough	1983:I	57%→2%	1982:12	71%→10%	1982:11	1983:07

Real Time Probabilities of the 1990-91 Recession and NBER Dating

Univariate MS Model



MS Dynamic Factor Model

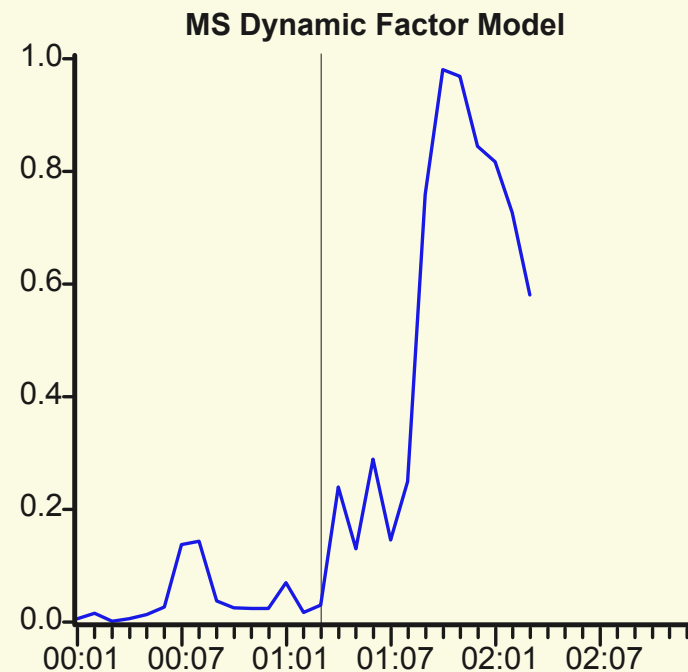
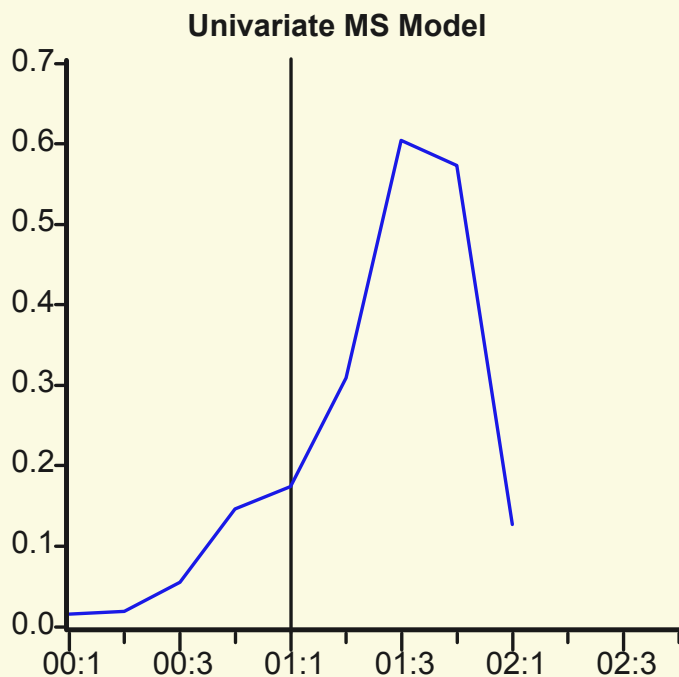


1990-1991 Recession

1990-91 Recession

Turning Points	Univariate MS		DFMS		NBER	Announced
	Peak	Trough	Peak	Trough		
Peak	1990:IV	34%→85%	1990:08	17%→57%	1990:07	1991:03
Trough	1992:I	61%→48%	1992:03	64%→24%	1991:03	1992:12

Real Time Probabilities of the 2001 Recession and NBER Dating



2001 Recession

2000-01 Recession

Turning Points	Univariate MS		DFMS		NBER	Announced
	Peak	Trough	Peak	Trough		
Peak	2001:III	31%→60%	2001:07	27%→51%	2001:03	2001:11
Trough	2001:IV	57%→13%	2002:03	58%→	-	-

2001 Recession

Probabilities of Recession Dynamic Factor Model with Regime Switching

Period	Real Time Probabilities of Recession (%)	Full Information Probabilities of Recession (%)
2001 - Jan	12.7	36.5
Feb	4.3	41.5
Mar	6.8	63.4 Peak
Apr	35.3	84.0
May	26.7	86.9
Jun	51.4	92.4
Jul	39.1	93.9
Aug	51.6	97.2
Sept	75.8	99.3
Oct	98.0	99.6
Nov	96.8	97.3
Dec	84.3	88.5
2002 - Jan	81.6	81.2
Feb	72.6	65.3
Mar	58.0	58.0

2001 Recession

Probabilities of Recession Univariate Markov Switching Model

Period	Real Time Probabilities of Recession (%)	Full Information Probabilities of Recession (%)
2001 – Q1	17.4	56.8 Peak
Q2	30.9	71.3
Q3	60.4	77.1
Q4	57.3	64.4
2002 – Q1	12.7	12.7

Conclusions

- ✓ Univariate MS and DFMS models would have predicted recessions quite accurately in real time
- ✓ Models yield timely turning point dating