

RECESSION DETECTION USING CLASSIFIERS ON THE ANTICIPATION-PRECISION FRONTIER

Pascal Michaillat

December 2025

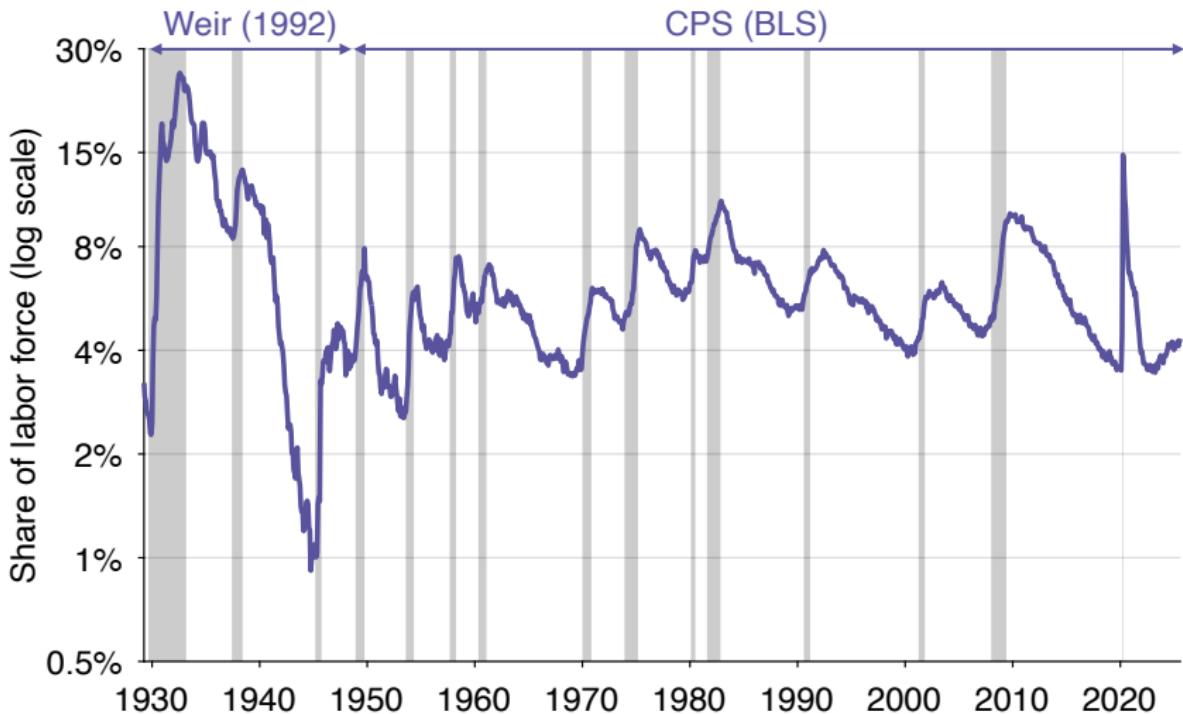
Available at <https://pascalmichaillat.org/17/>

NBER RECESSION START ANNOUNCEMENTS

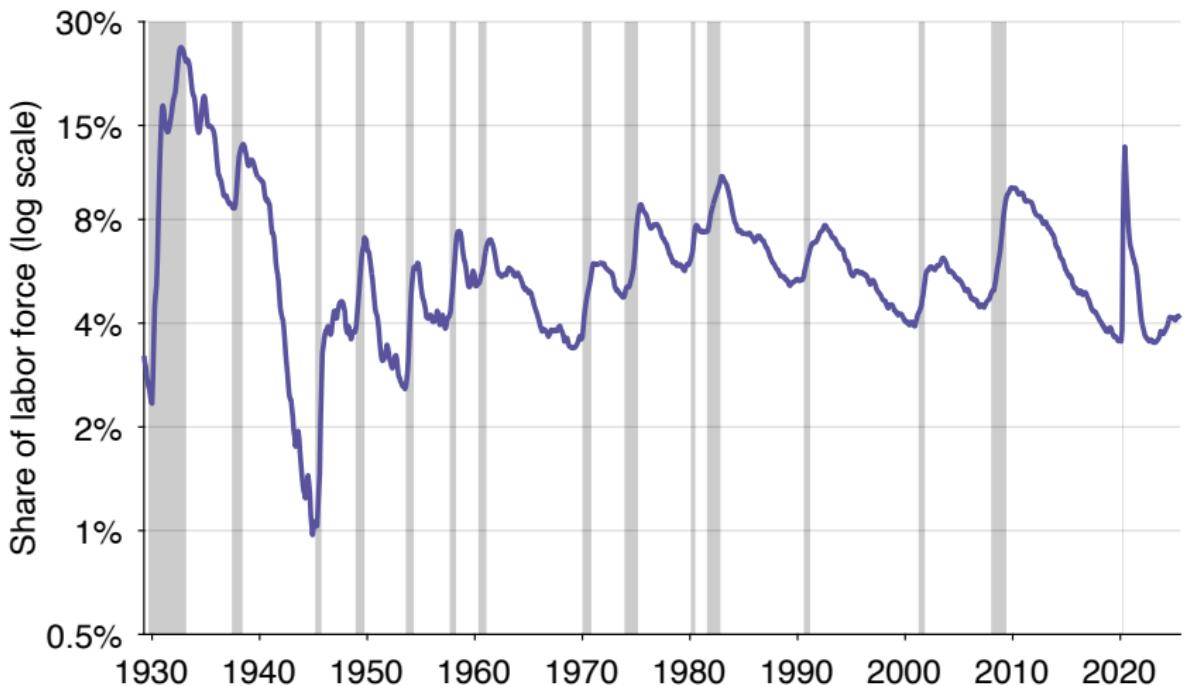
Start date	Announcement date	Delay (months)
January 1980	June 1980	5
July 1981	January 1982	6
July 1990	April 1991	9
March 2001	November 2001	8
December 2007	December 2008	12
February 2020	June 2020	4
Mean:		7.3
Standard deviation:		2.7

BACKGROUND: SAHM RULE

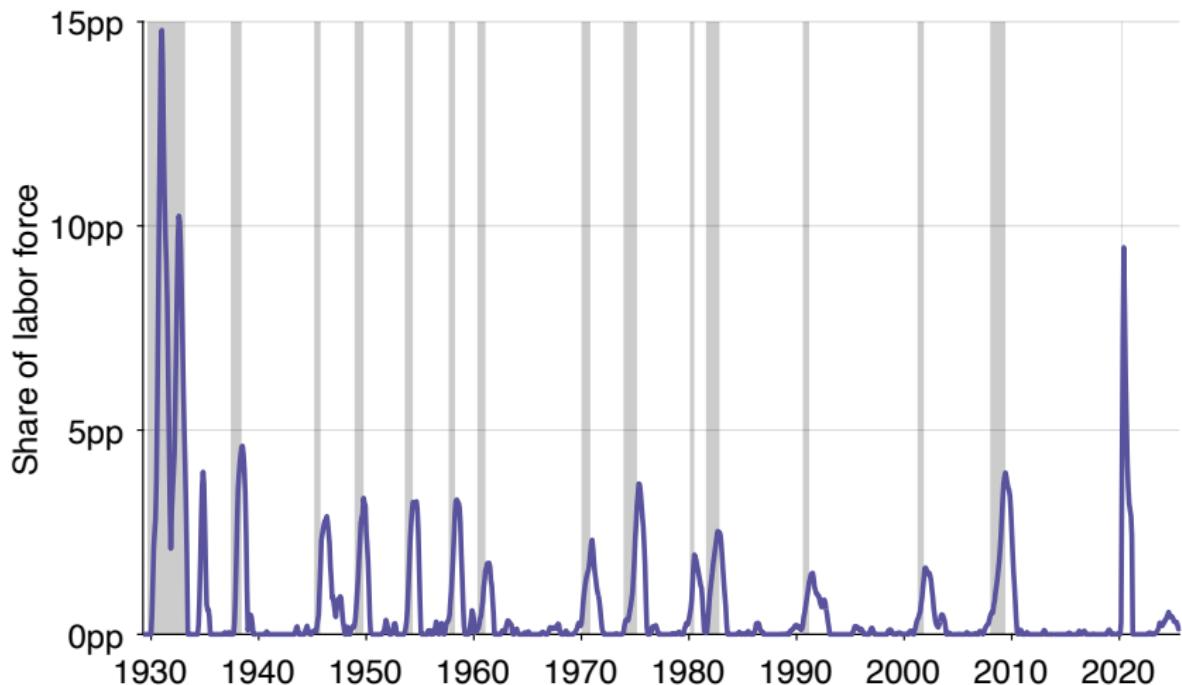
US UNEMPLOYMENT RATE & US RECESSIONS, 1929–2025



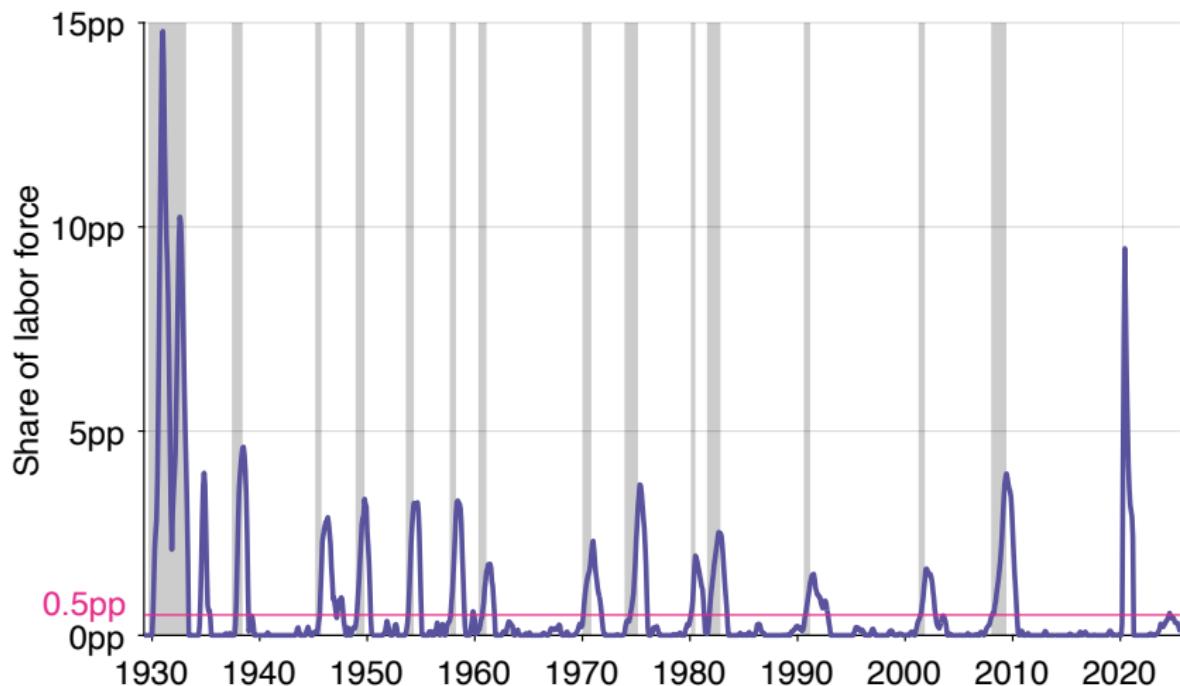
SAHM RULE: SMOOTHING WITH 3-MONTH TRAILING AVERAGE



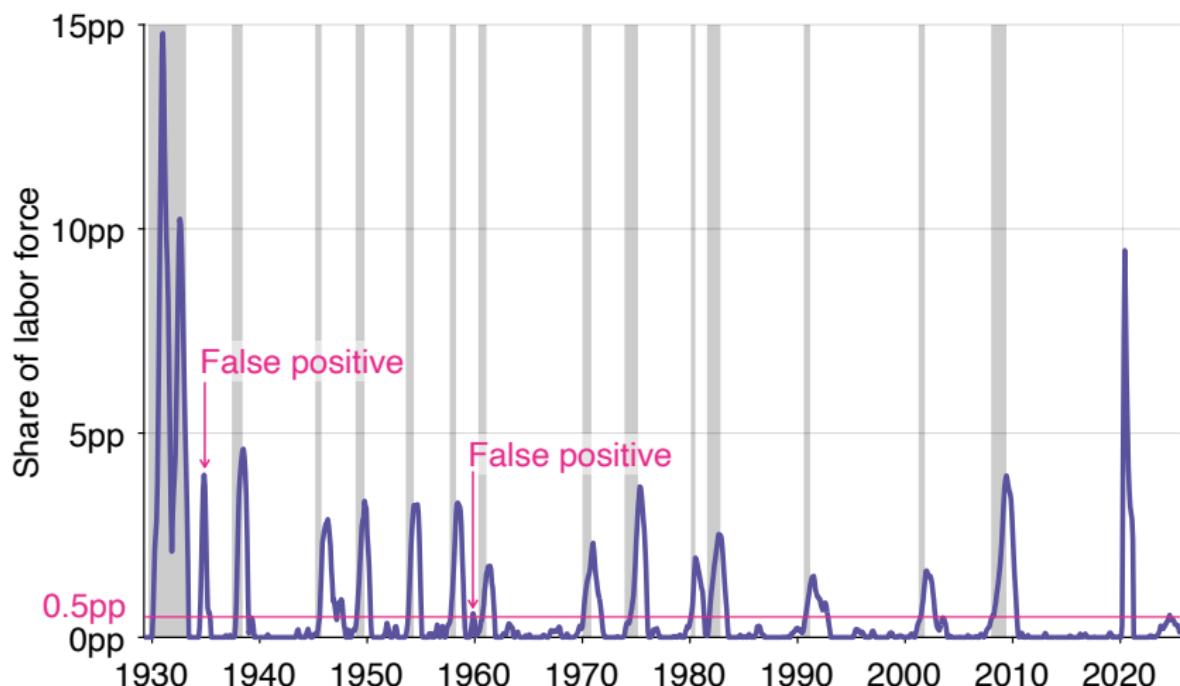
SAHM RULE: INCREASE ABOVE 12-MONTH TRAILING MINIMUM



SAHM RULE: RECESSION THRESHOLD OF 0.50PP

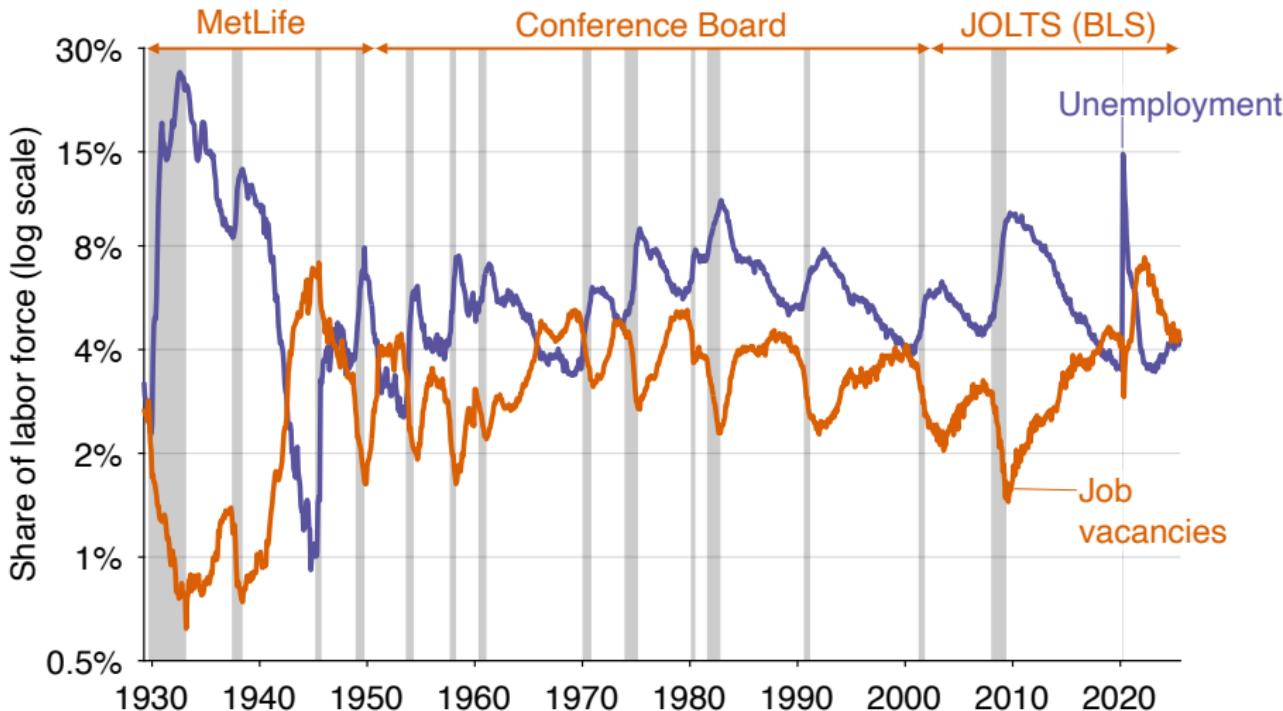


SAHM RULE: FALSE POSITIVES IN 1934 AND 1959

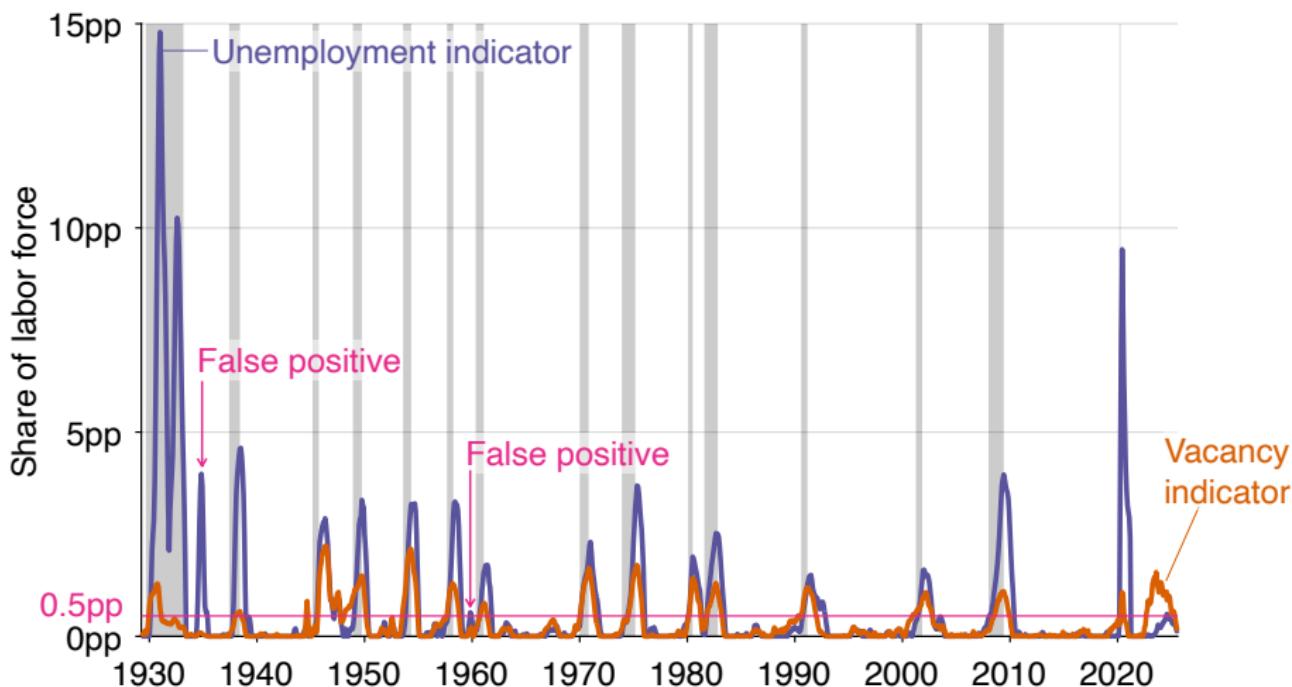


BACKGROUND: MICHEZ RULE

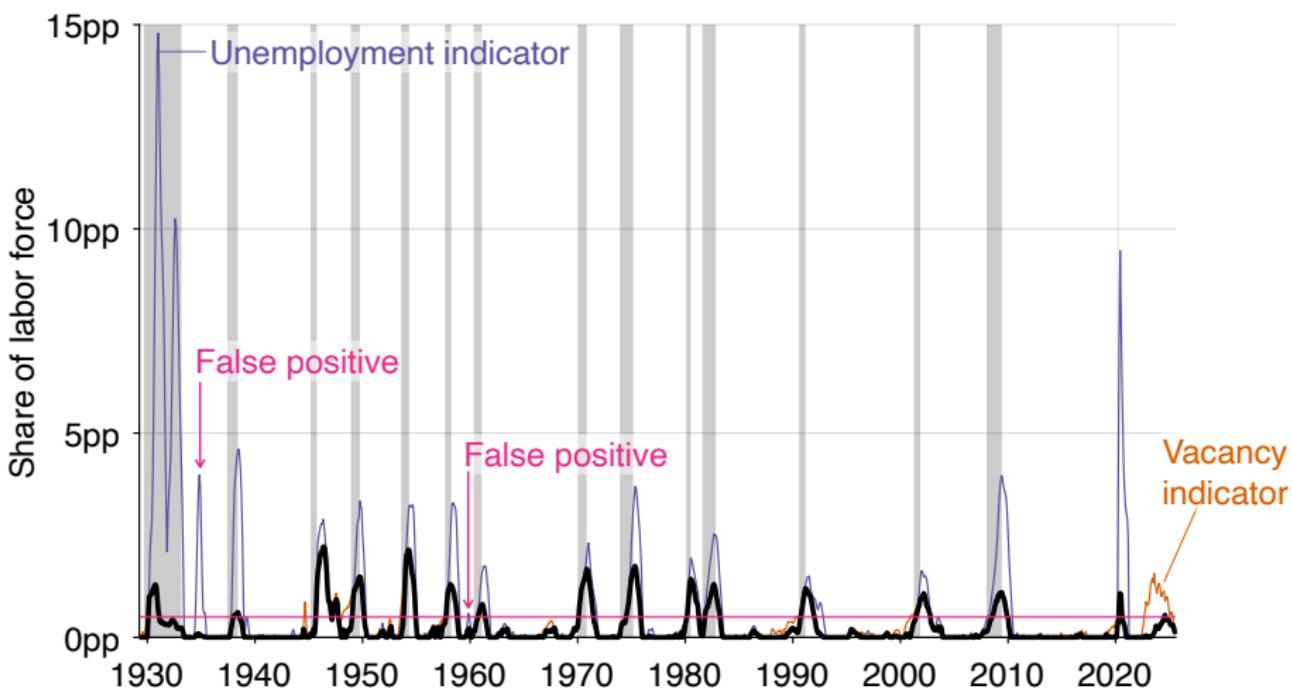
BEVERIDGE CURVE: VACANCIES ↓ WHEN UNEMPLOYMENT ↑



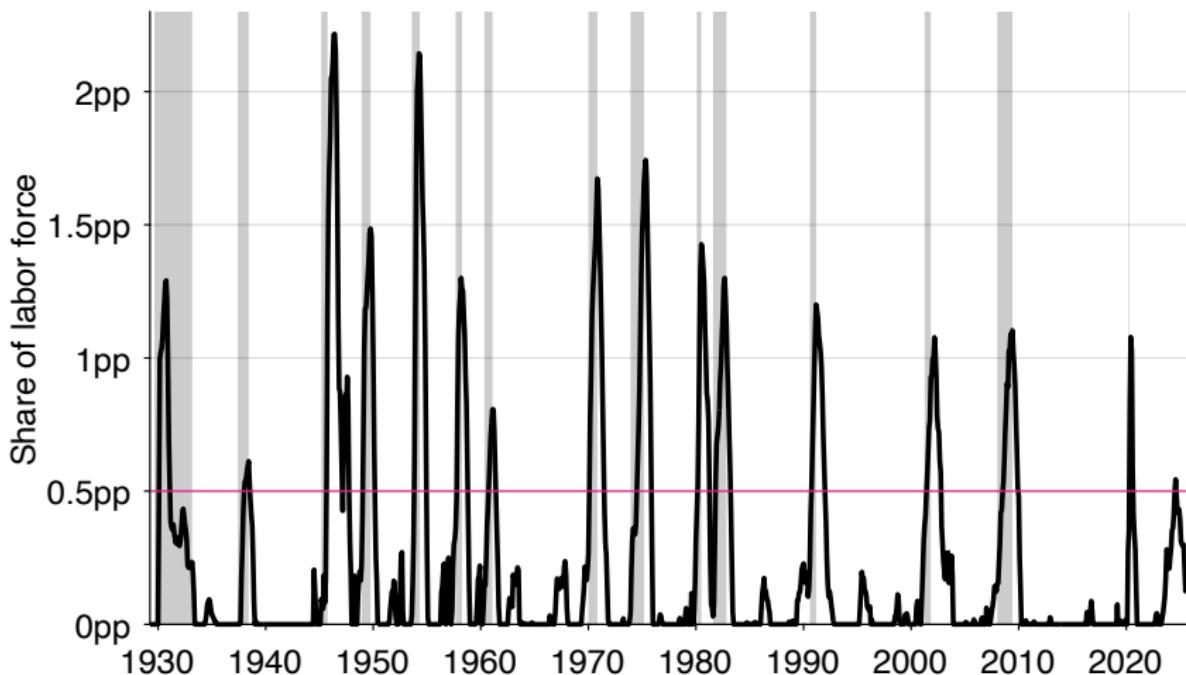
UNEMPLOYMENT INDICATOR & VACANCY INDICATOR



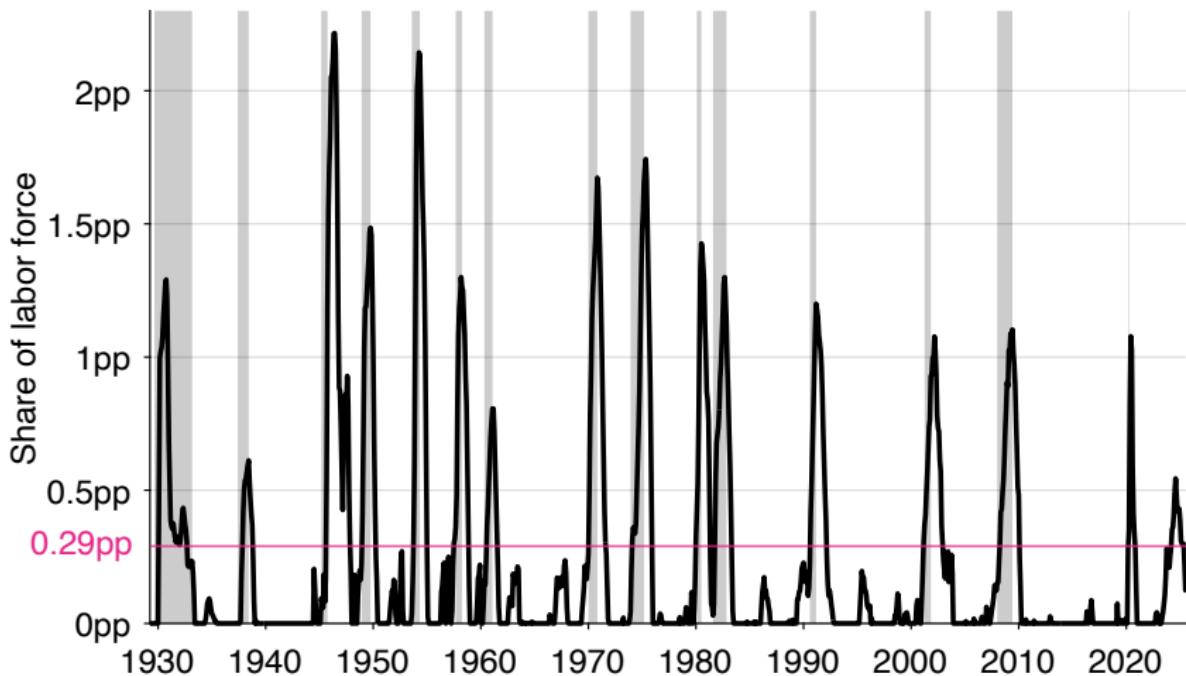
MICHEZ RULE: MINIMUM OF TWO INDICATORS



MICHEZ RULE: NO ERRORS ON 1929–2021



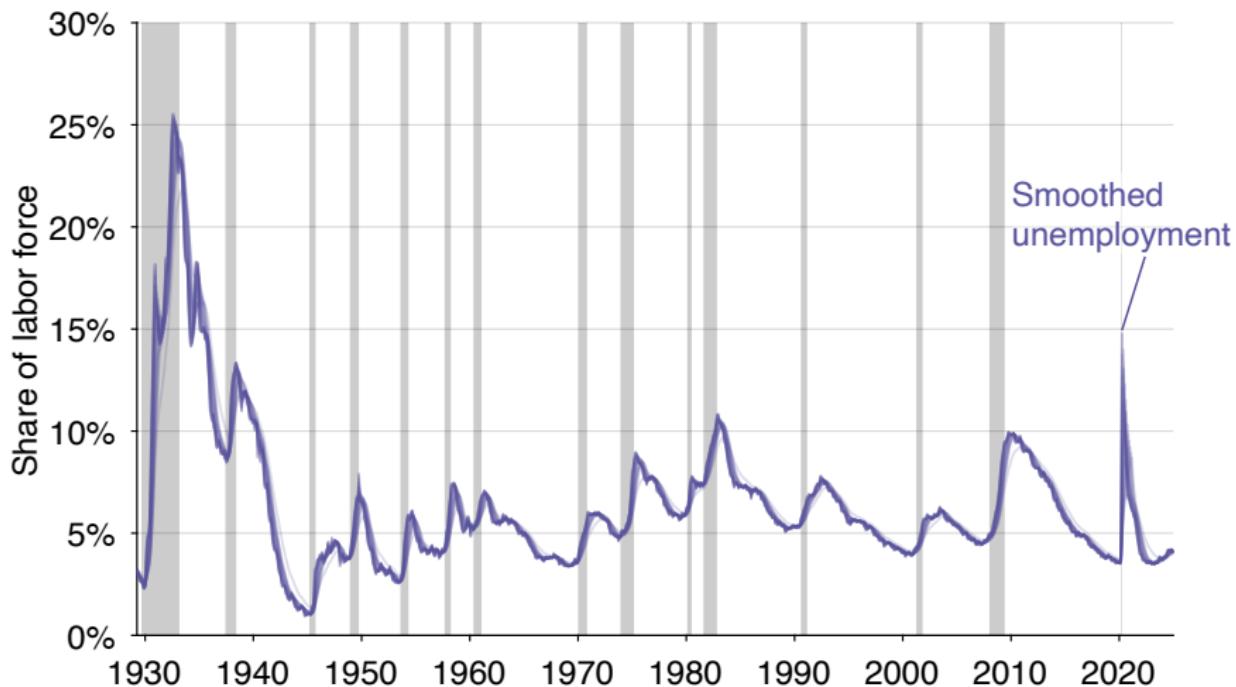
MICHEZ RULE: DETECTION DELAY REDUCED BY 1.5M, TO 1.2M



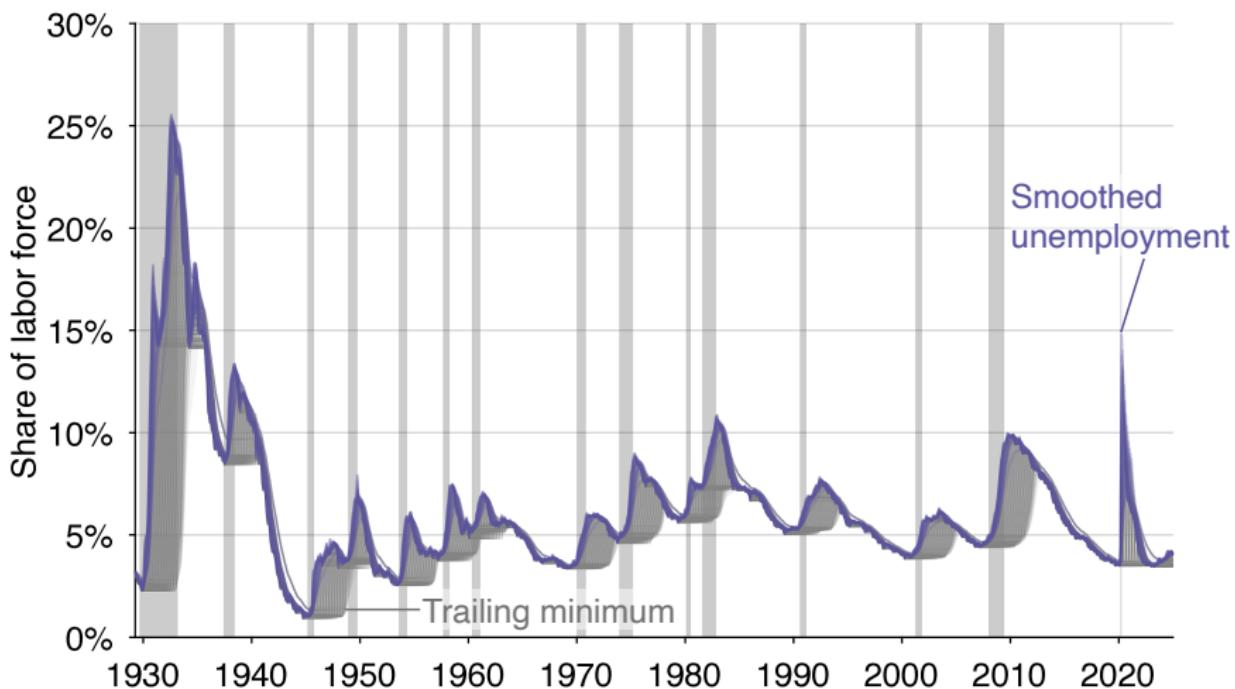
THIS PAPER: FILTERING LABOR-MARKET DATA
OPTIMALLY

1. Smoothing data by moving average
 - $\bar{u}(t) = [\sum_{i=0}^{\alpha} u(t-i)] / (\alpha + 1)$ with $\alpha = 0, 1, \dots, 11$
 - $\bar{u}(t) = \alpha \cdot u(t) + (1 - \alpha) \cdot \bar{u}(t-1)$ with $\alpha = 0.1, 0.2, \dots, 1$
2. Detecting turning points
 - $\tilde{u}(t) = \bar{u}(t) - \min_{0 \leq i \leq \beta} \bar{u}(t-i)$ with $\beta = 1, 2, \dots, 18$
3. Scaling variations by Box-Cox transformation
 - $\hat{u}(t) = \tilde{u}(t) / \bar{u}(t)^{\gamma}$ with $\gamma = 0, 0.1, \dots, 1$
4. Combining indicators
 - $i(t) = \delta \cdot \hat{u}(t) + (1 - \delta) \cdot \hat{v}(t)$ with $\delta = 0, 0.1, \dots, 1$
 - $i(t) = \delta \cdot \min(\hat{u}(t), \hat{v}(t)) + (1 - \delta) \cdot \max(\hat{u}(t), \hat{v}(t))$ with $\delta = 0, 0.1, \dots, 1$

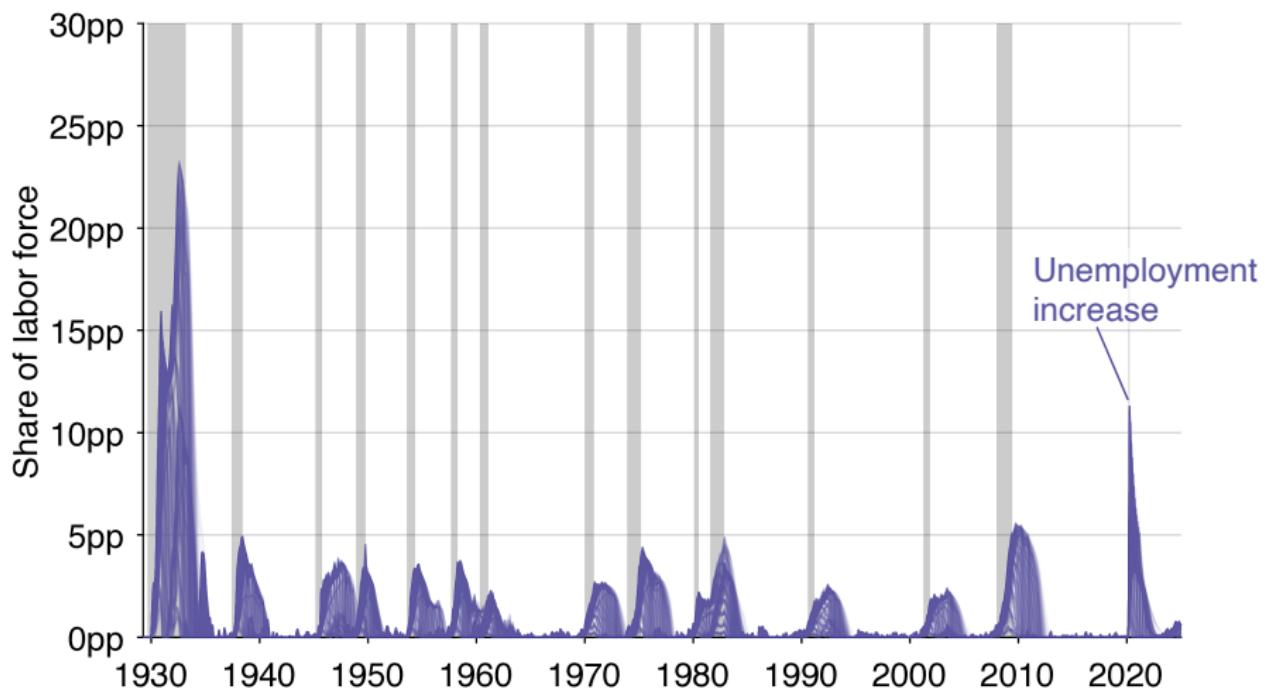
SMOOTHING UNEMPLOYMENT RATE



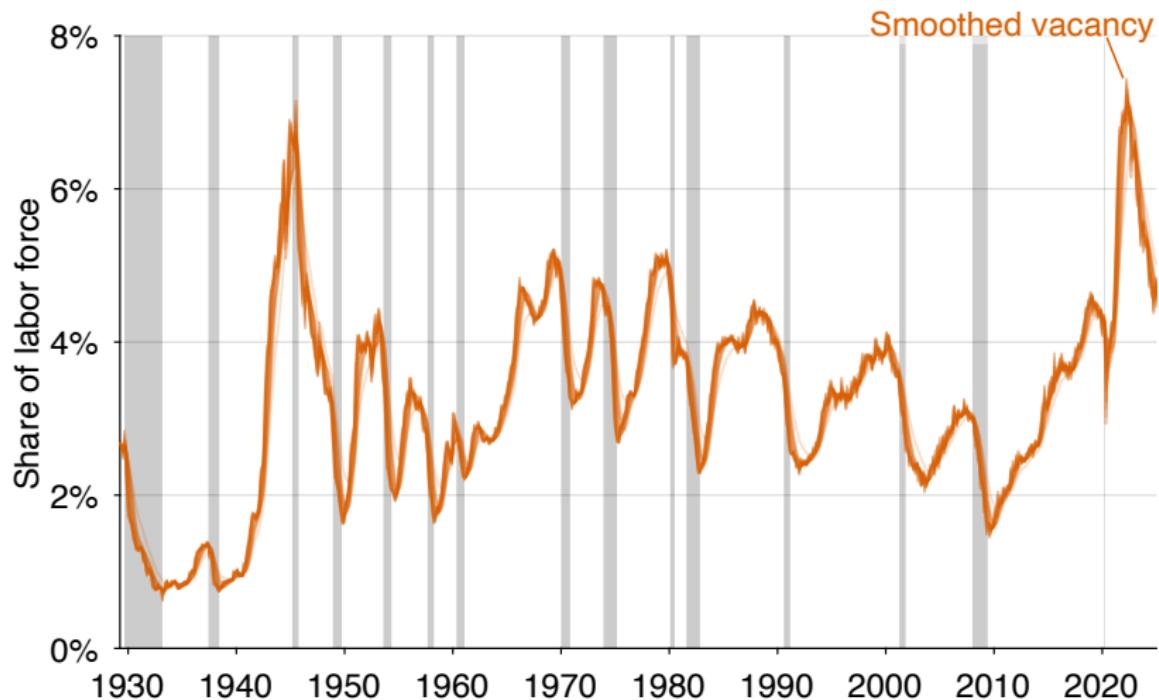
DETECTING UNEMPLOYMENT TURNING POINTS



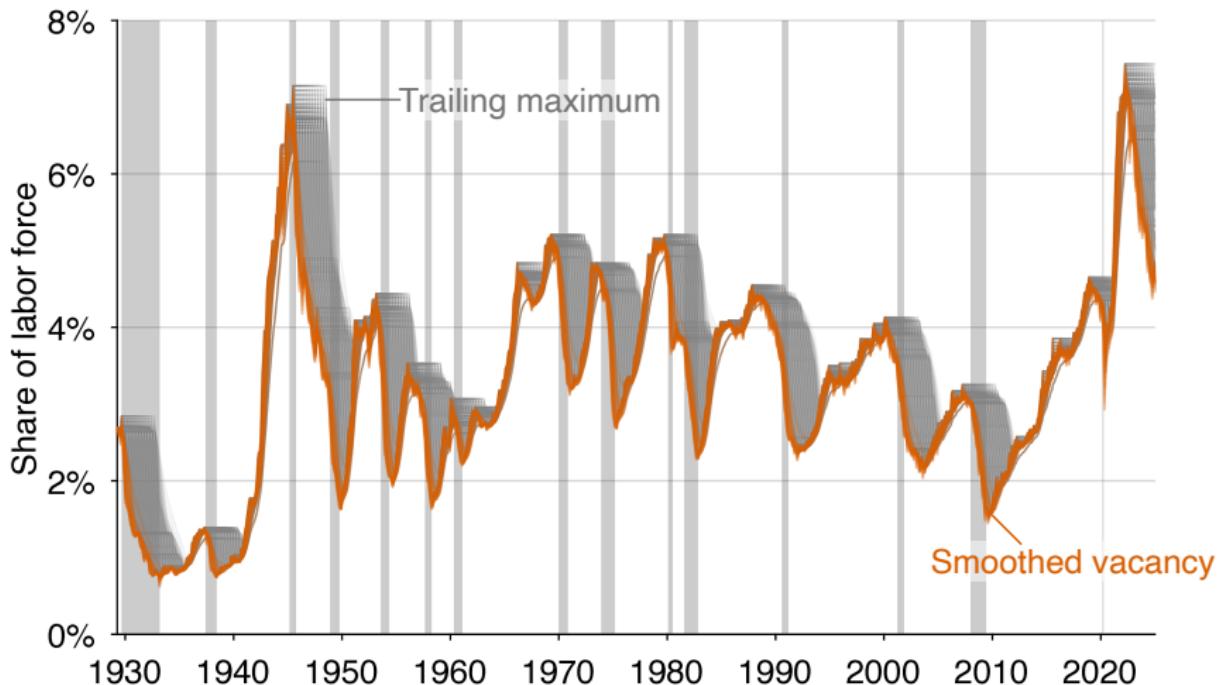
COMPUTING UNEMPLOYMENT INCREASES



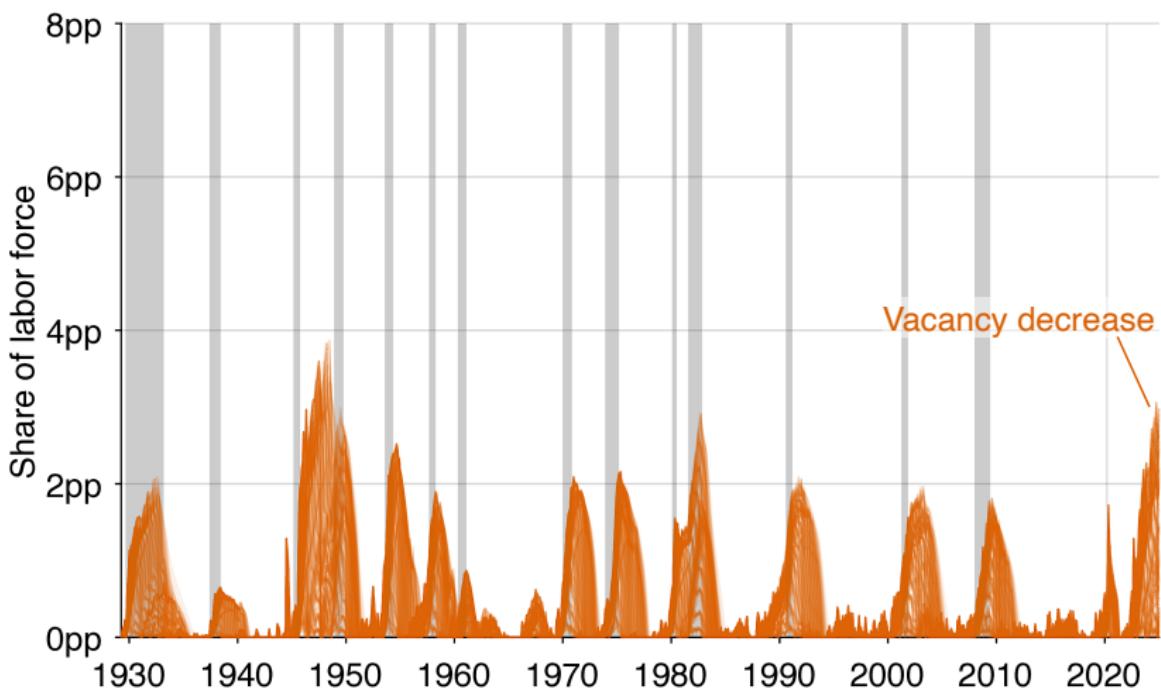
SMOOTHING VACANCY RATE



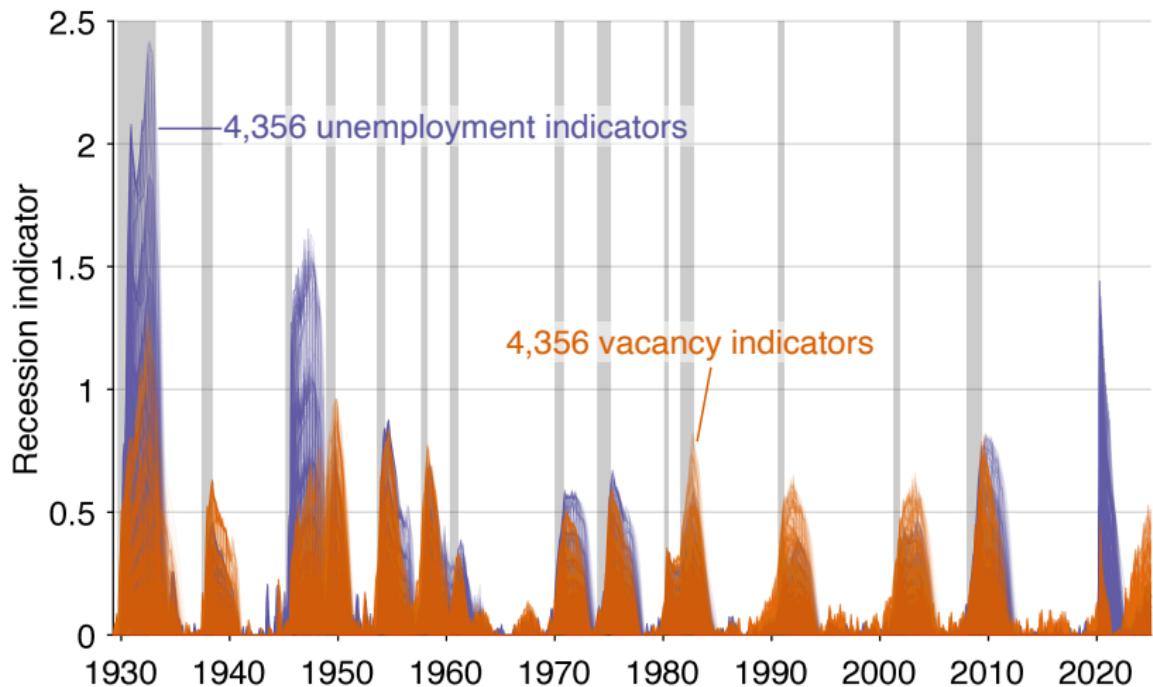
DETECTING VACANCY TURNING POINTS



COMPUTING VACANCY DECREASES

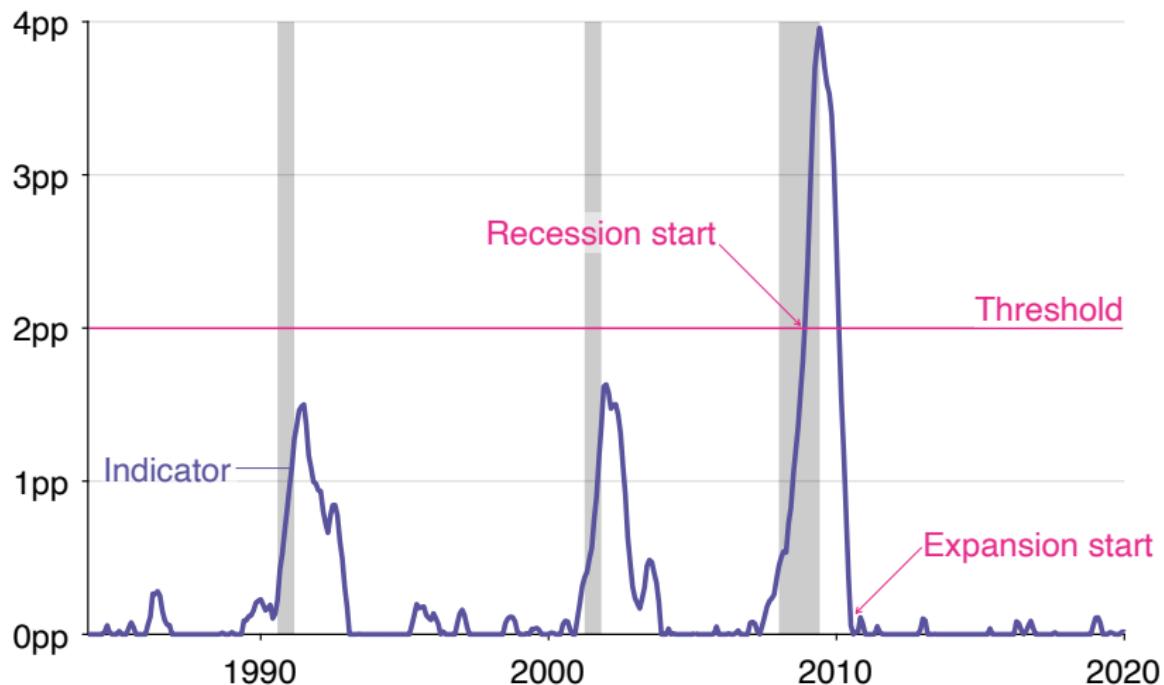


95,832 RECESSION INDICATORS CREATED BY COMBINATIONS

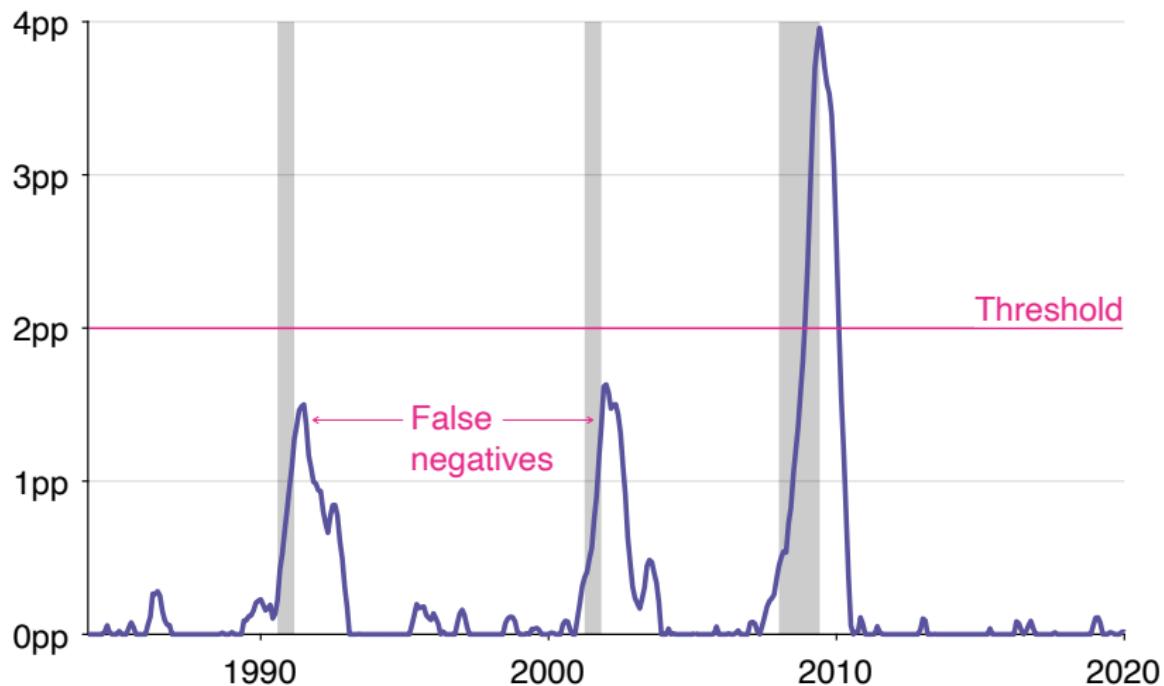


CONSTRUCTING & EVALUATING RECESSION CLASSIFIERS

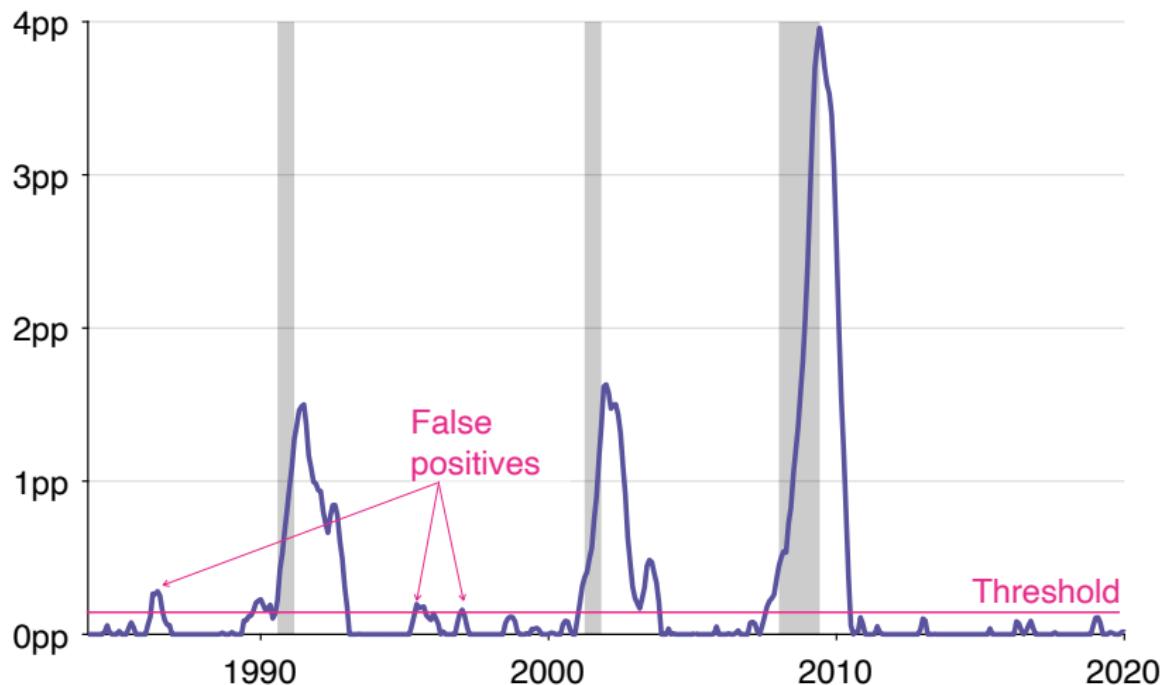
RECESSION CLASSIFIER = INDICATOR + THRESHOLD



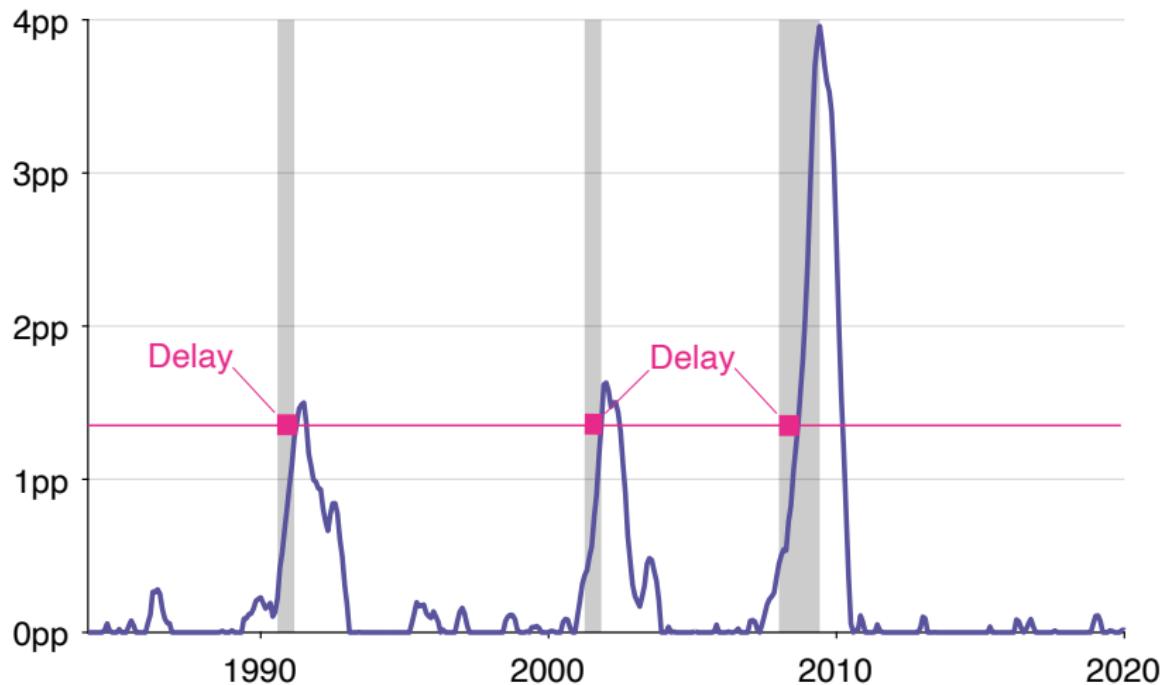
SELECT CLASSIFIERS WITHOUT FALSE NEGATIVES...



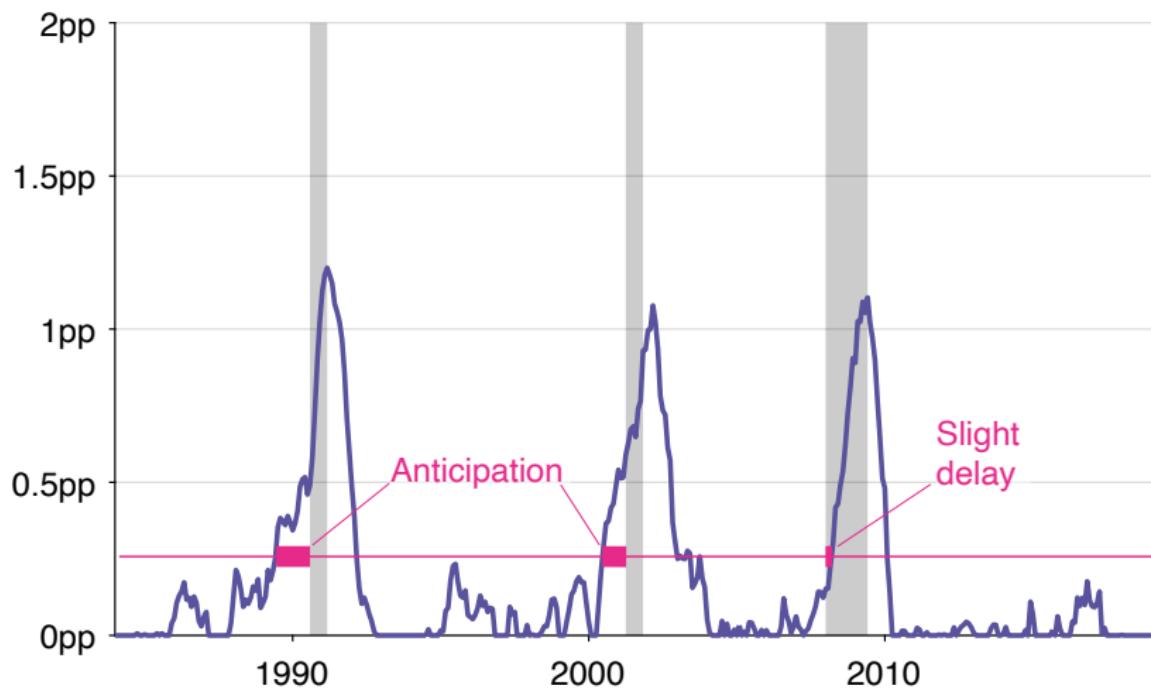
...AND WITHOUT FALSE POSITIVES



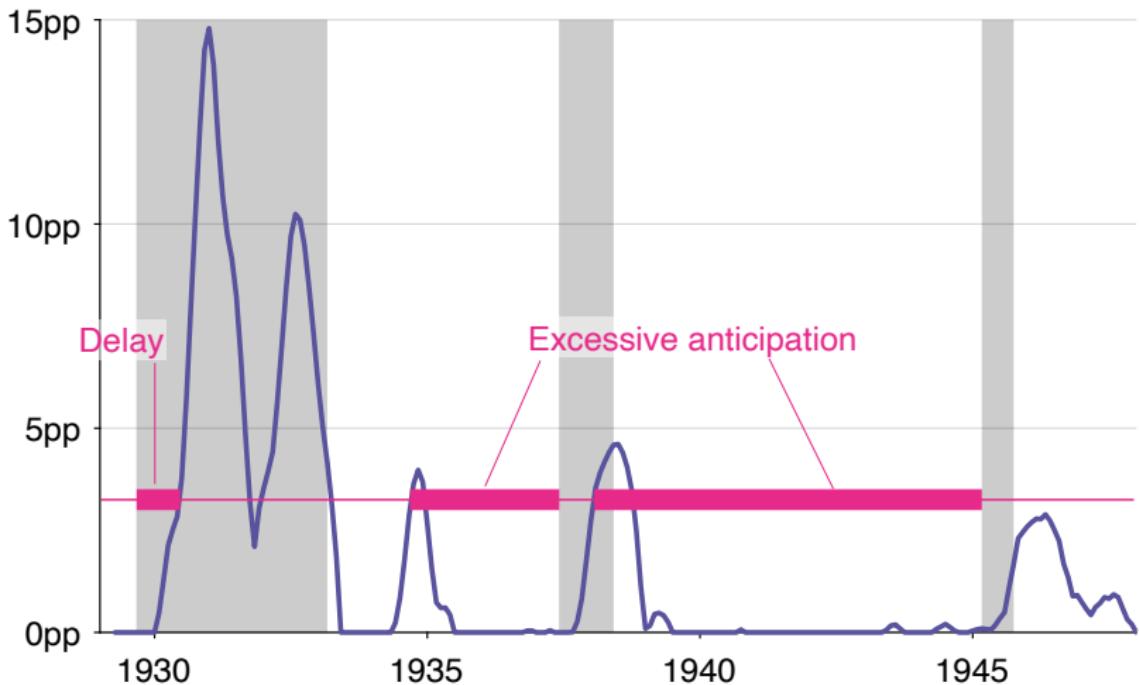
HOW TO EVALUATE 4,481,622 PERFECT CLASSIFIERS?



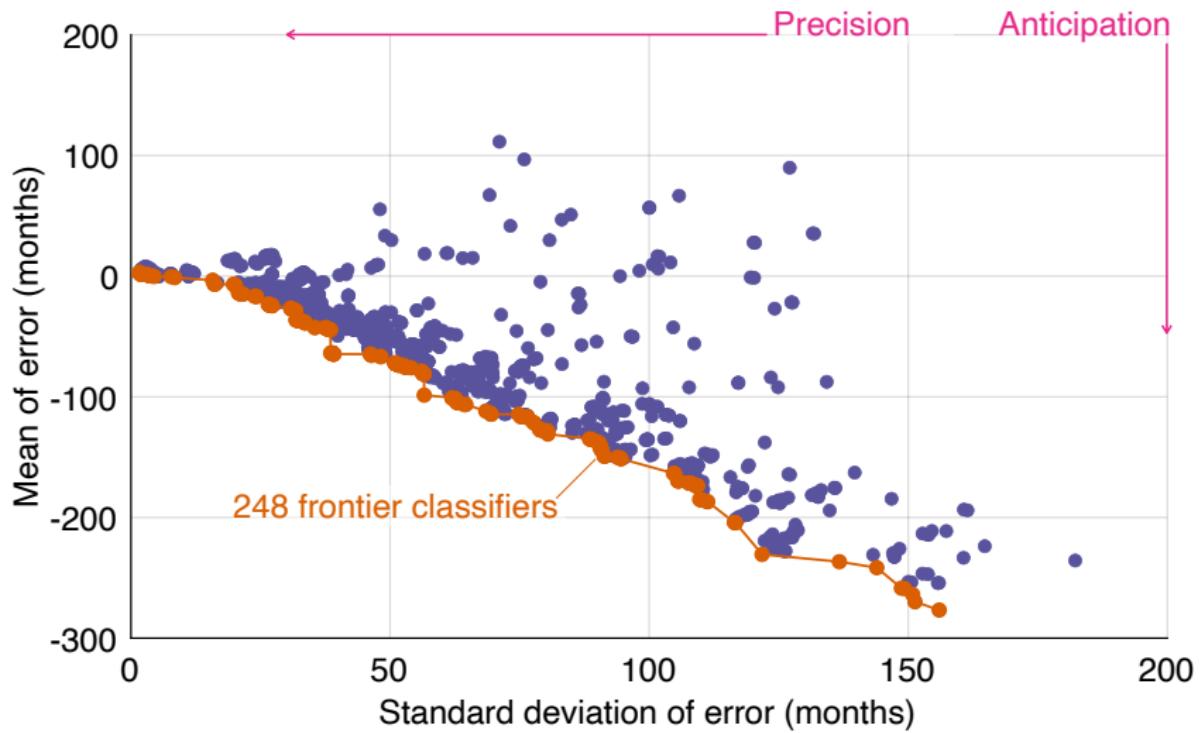
HOW TO EVALUATE 4,481,622 PERFECT CLASSIFIERS?



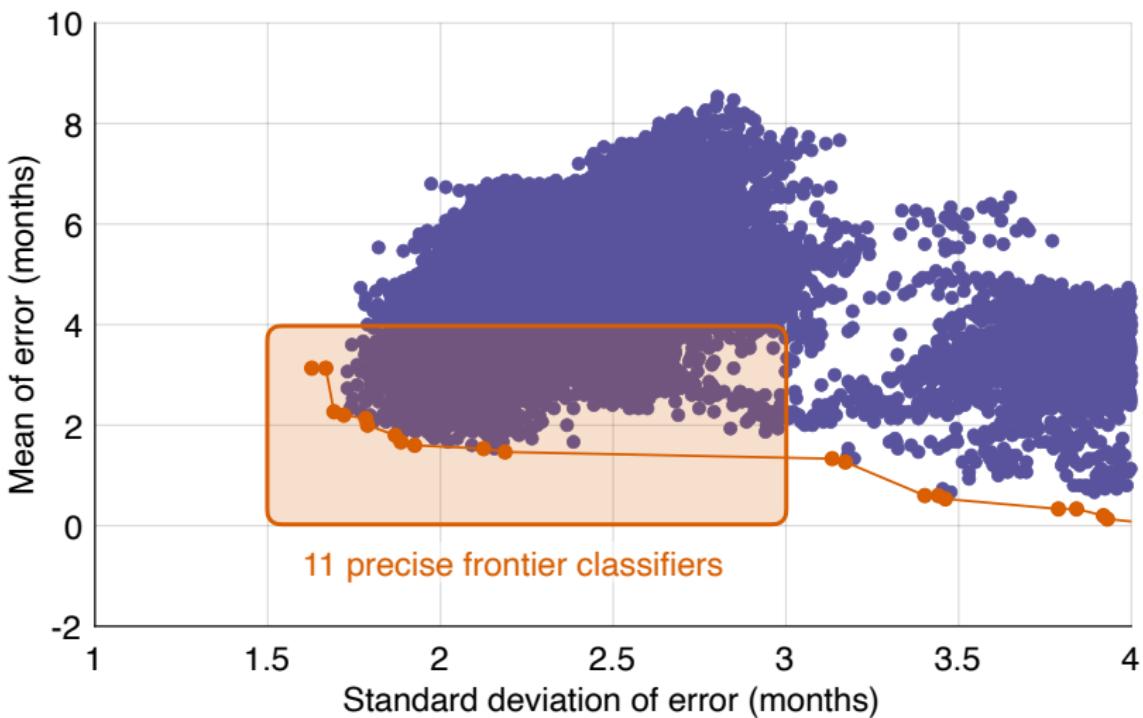
HOW TO EVALUATE 4,481,622 PERFECT CLASSIFIERS?



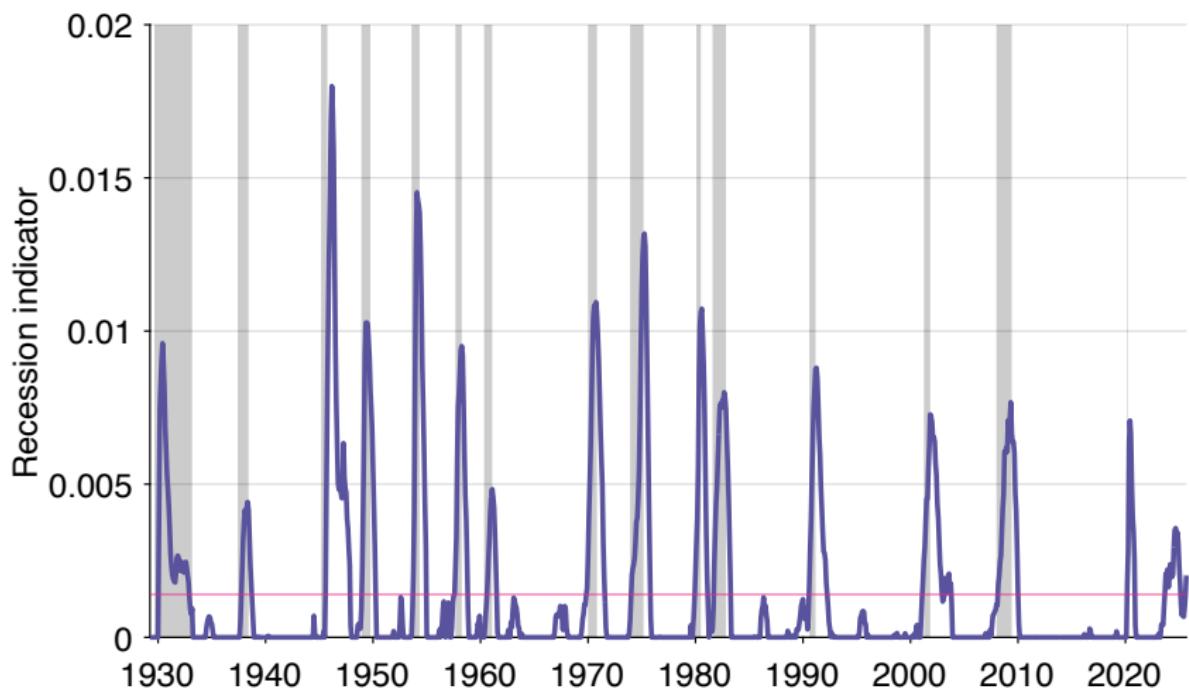
ANTICIPATION-PRECISION OF 4,481,622 PERFECT CLASSIFIERS



SELECT FRONTIER CLASSIFIERS DETECTING RECESSIONS WITHIN 6 MONTHS OF THEIR STARTS



A CLASSIFIER IN THE 11-CLASSIFIER ENSEMBLE



PERFORMANCE OF 11-CLASSIFIER ENSEMBLE

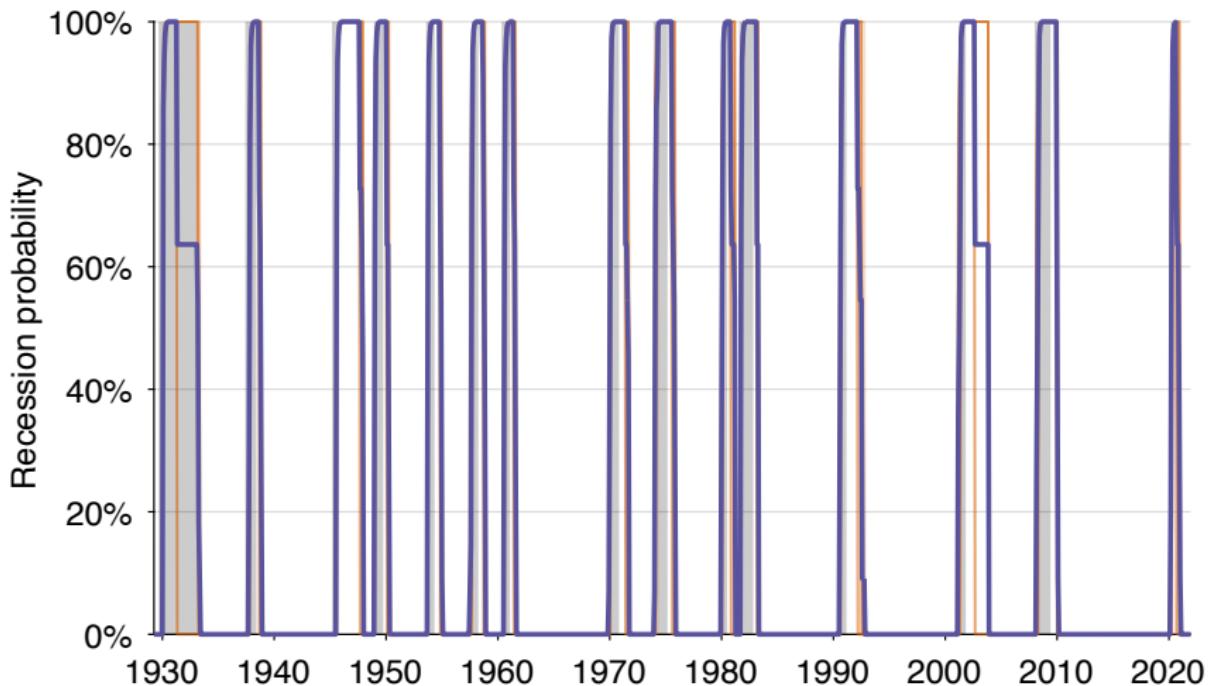
- Mean detection error in 1929–2021: 2.1m
- Standard deviation of detection error in 1929–2021: 1.8m
- Improvement over Michez rule in 1929–2021:
 - Distance from frontier in anticipation-precision plane: 0.4m
- Improvement over NBER Dating Committee in 1979–2021:
 - NBER announcements come 7.3m after recession onsets
 - 11 classifiers detect recessions 1.2m after their onsets
 - ~ Algorithm is 6.1m faster than NBER

COMPUTING RECESSION PROBABILITIES

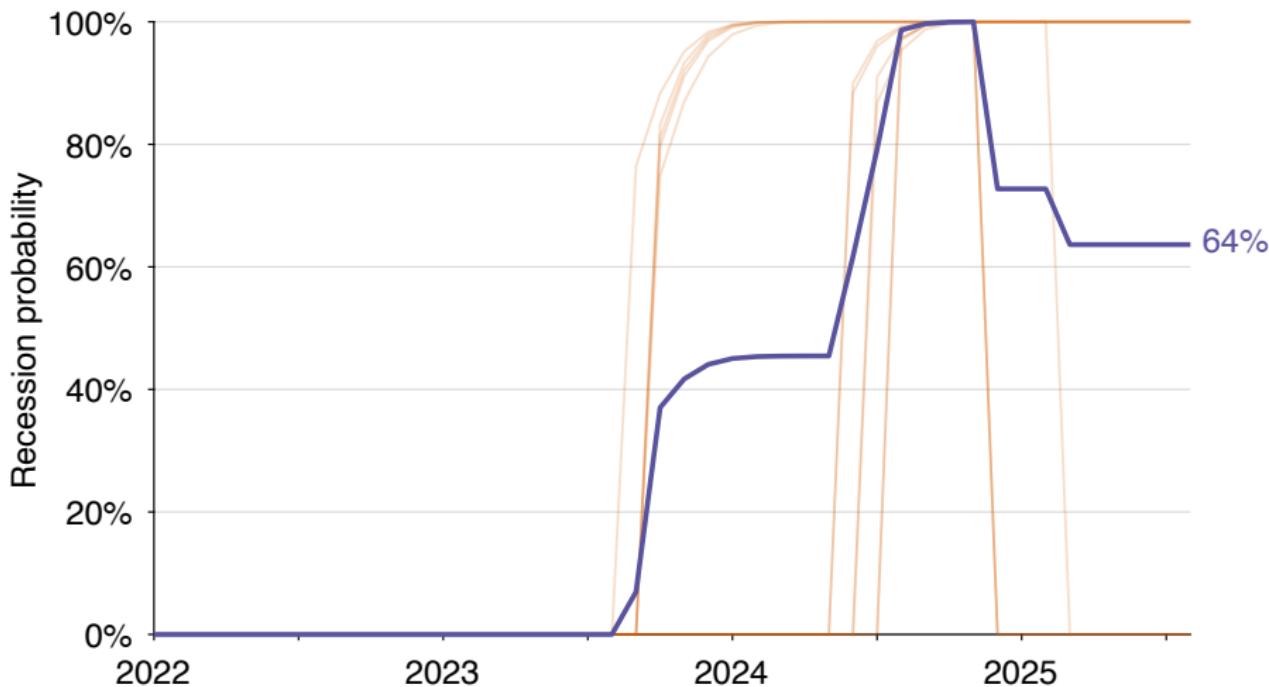
CLASSIFIERS ALSO GIVE RECESSION PROBABILITIES



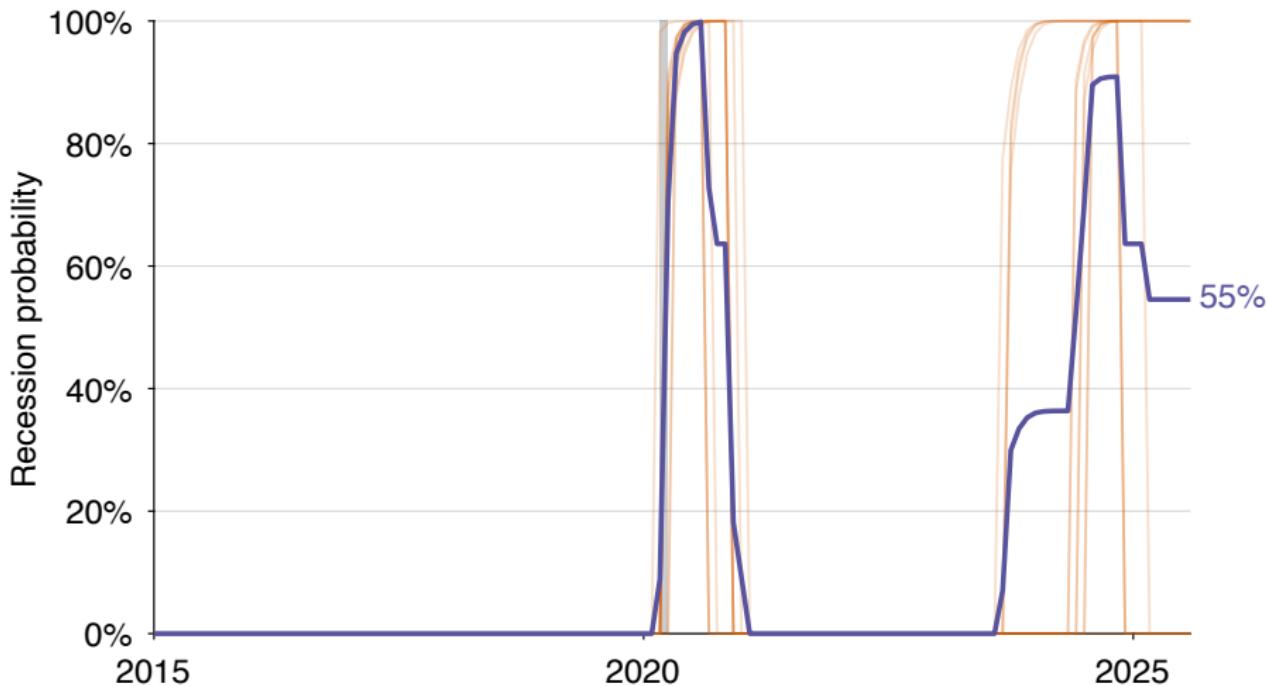
AVERAGE RECESSION PROBABILITY DURING TRAINING PERIOD



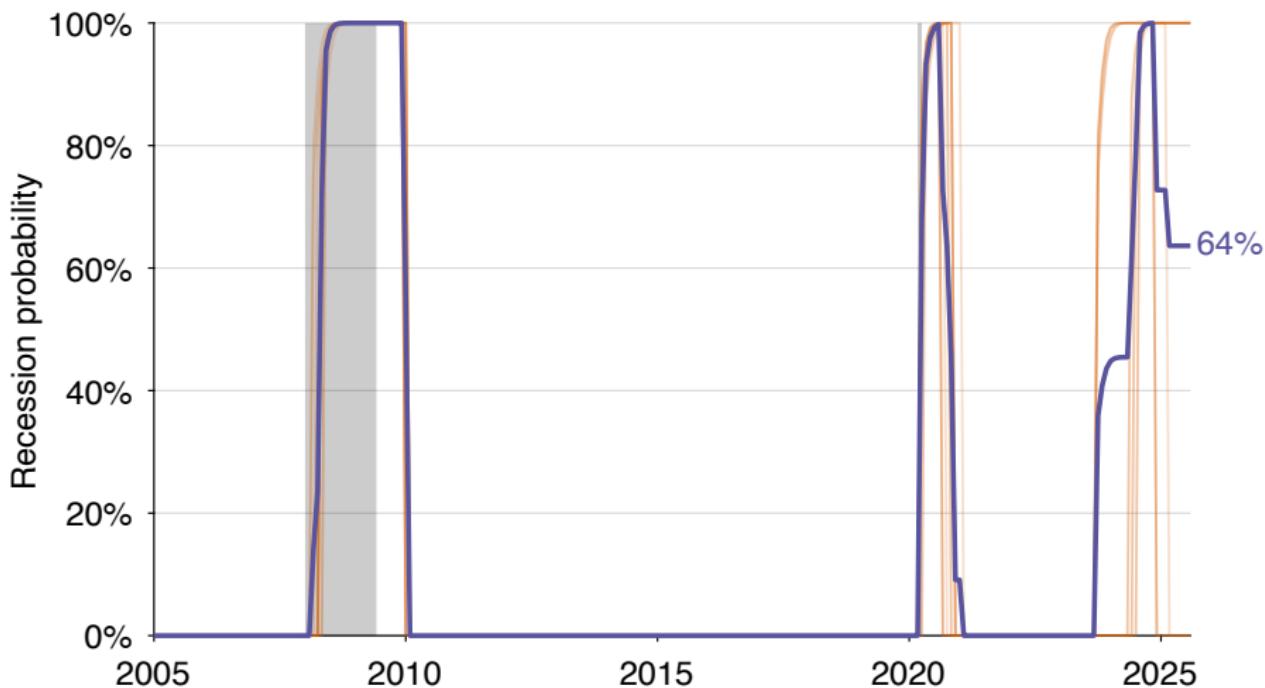
IN 2025, A RECESSION HAS STARTED WITH 64% PROBABILITY



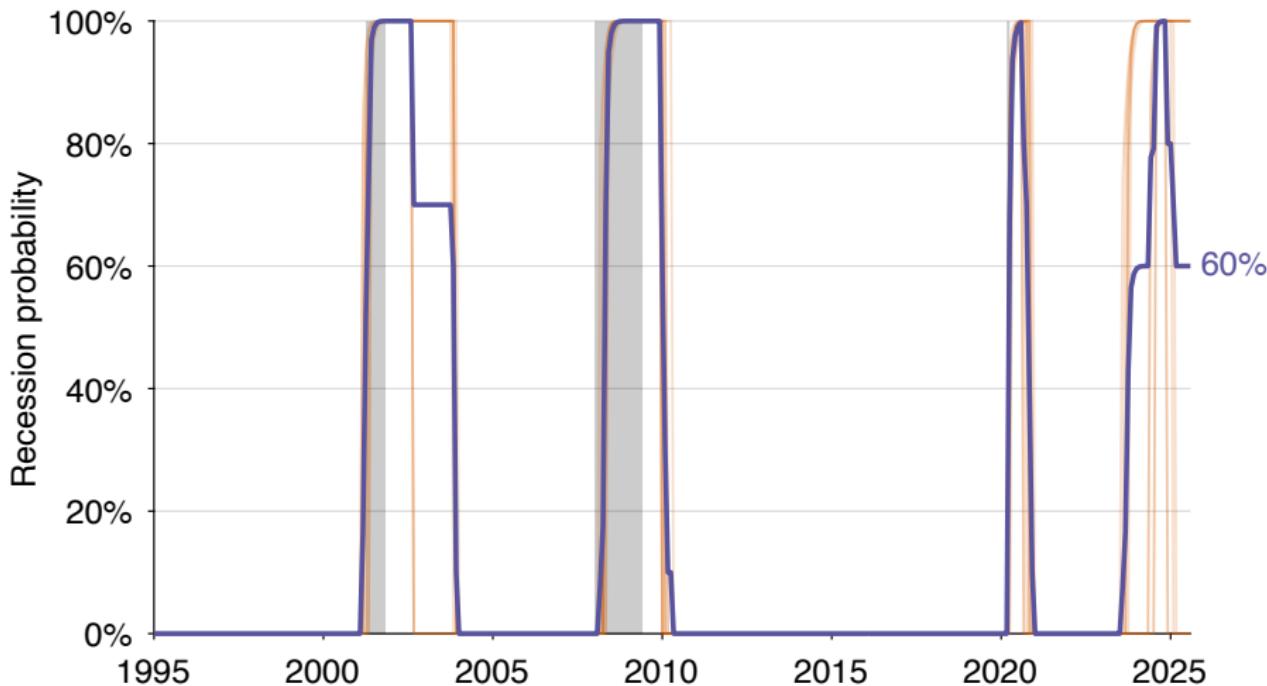
BACKTESTING FROM 2015 (TRAINING ON 14 RECESSIONS)



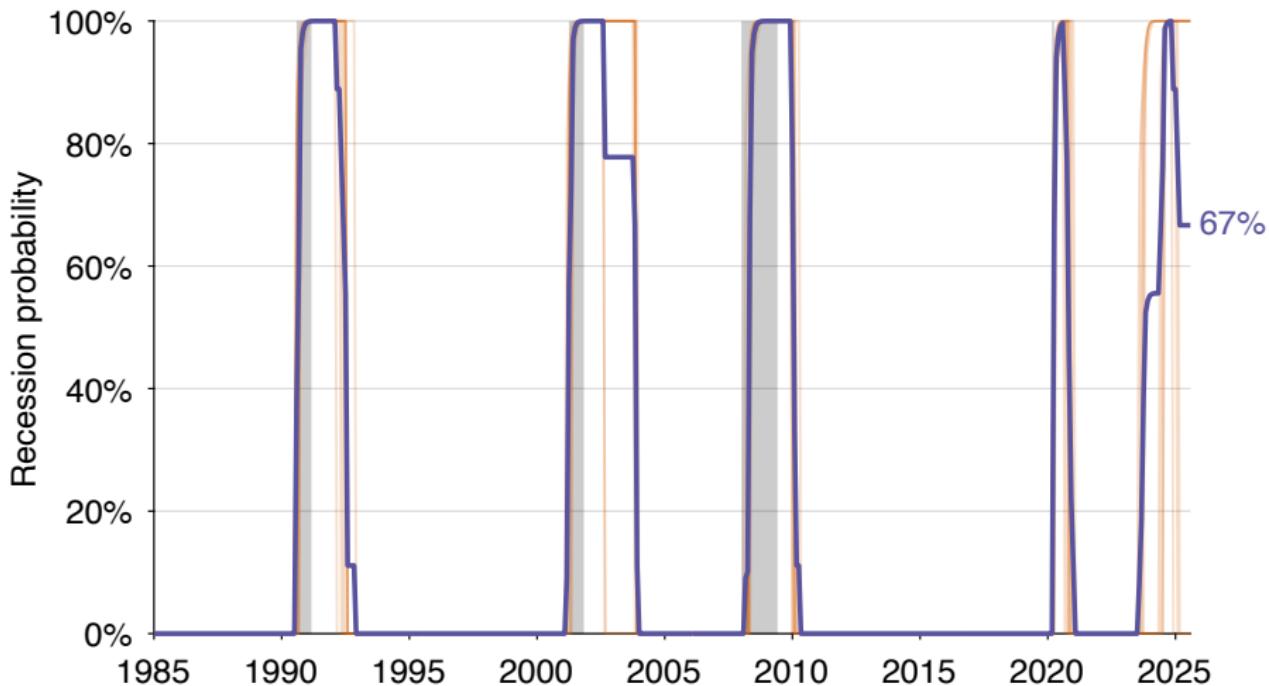
BACKTESTING FROM 2005 (TRAINING ON 13 RECESSIONS)



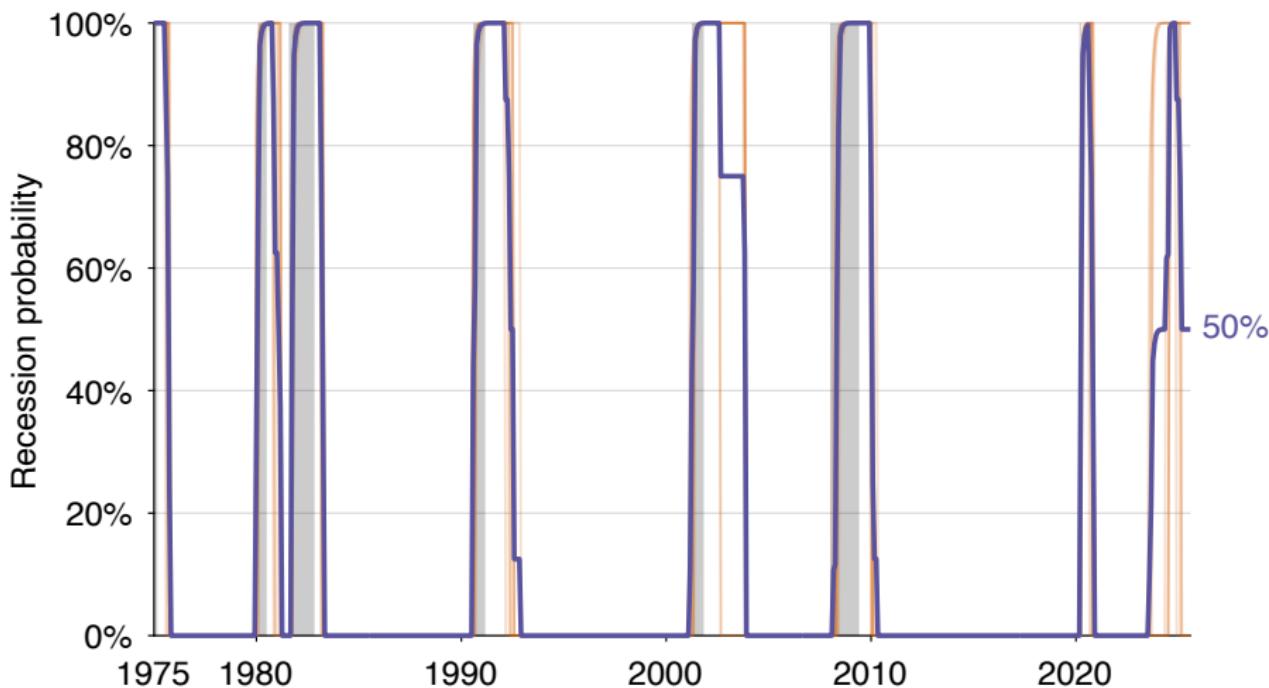
BACKTESTING FROM 1995 (TRAINING ON 12 RECESSIONS)



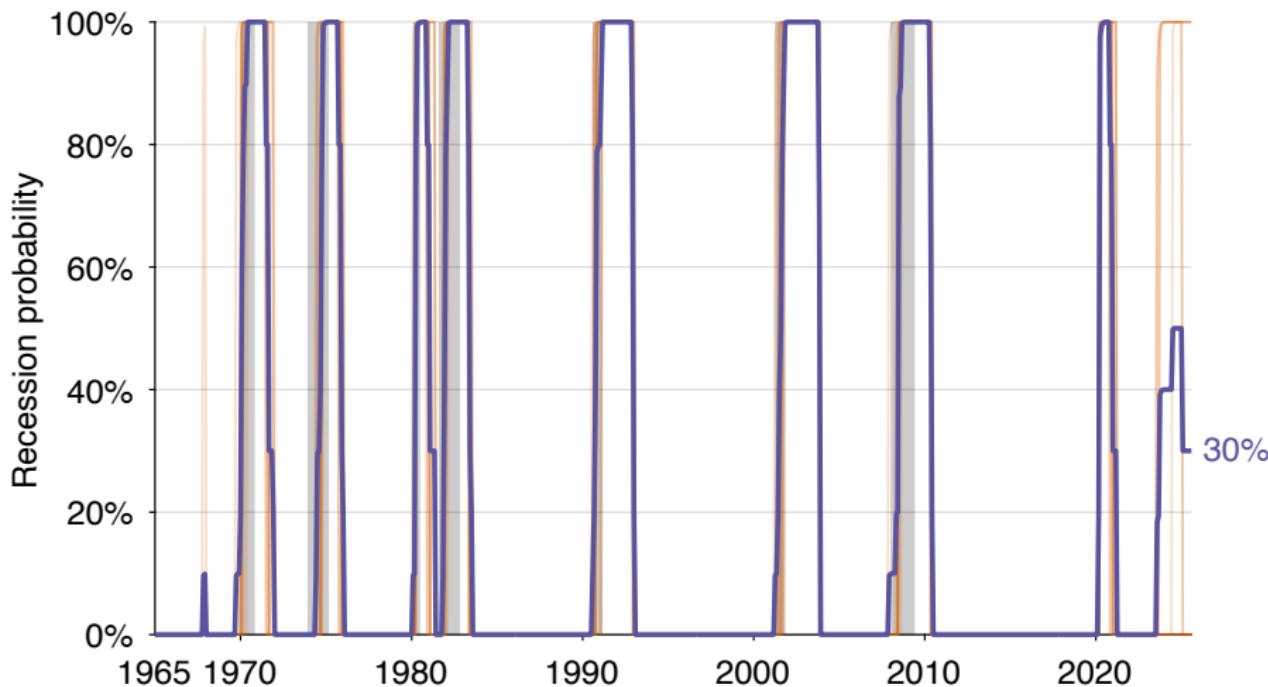
BACKTESTING FROM 1985 (TRAINING ON 11 RECESSIONS)



BACKTESTING FROM 1975 (TRAINING ON 9 RECESSIONS)

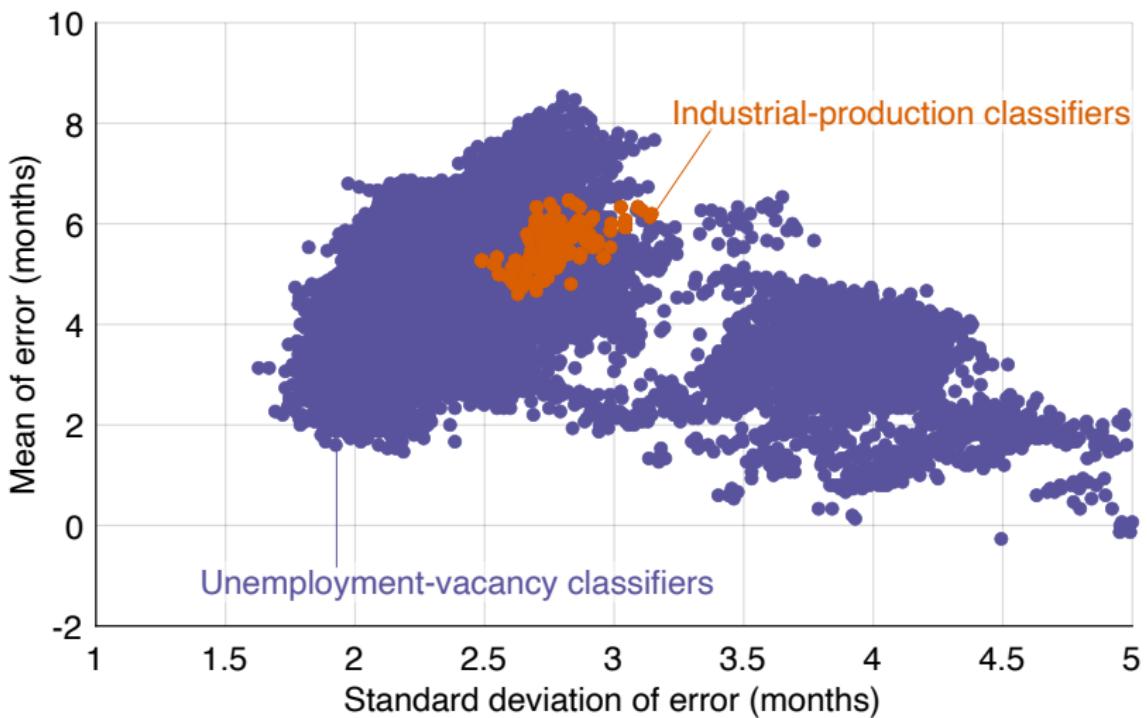


BACKTESTING FROM 1965 (TRAINING ON 7 RECESSIONS)

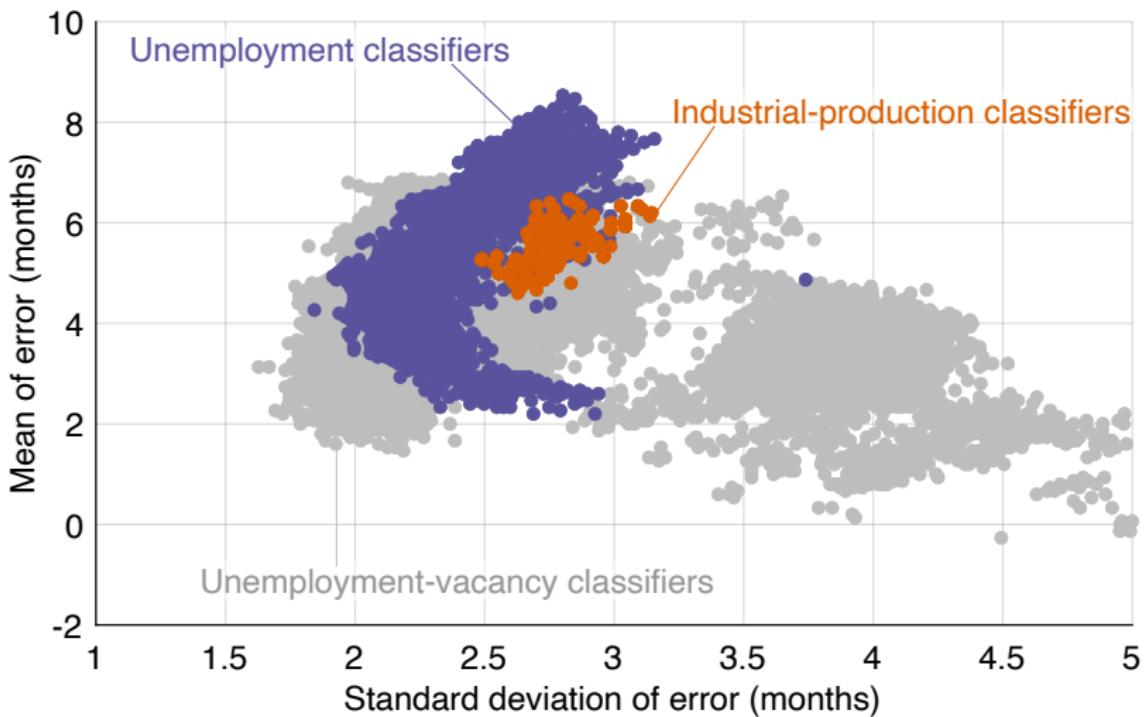


COMPARING PRODUCT-MARKET TO LABOR-MARKET CLASSIFIERS

INDUSTRIAL-PRODUCTION CLASSIFIERS PERFORM WORSE



INDUSTRIAL-PRODUCTION CLASSIFIERS PERFORM WORSE

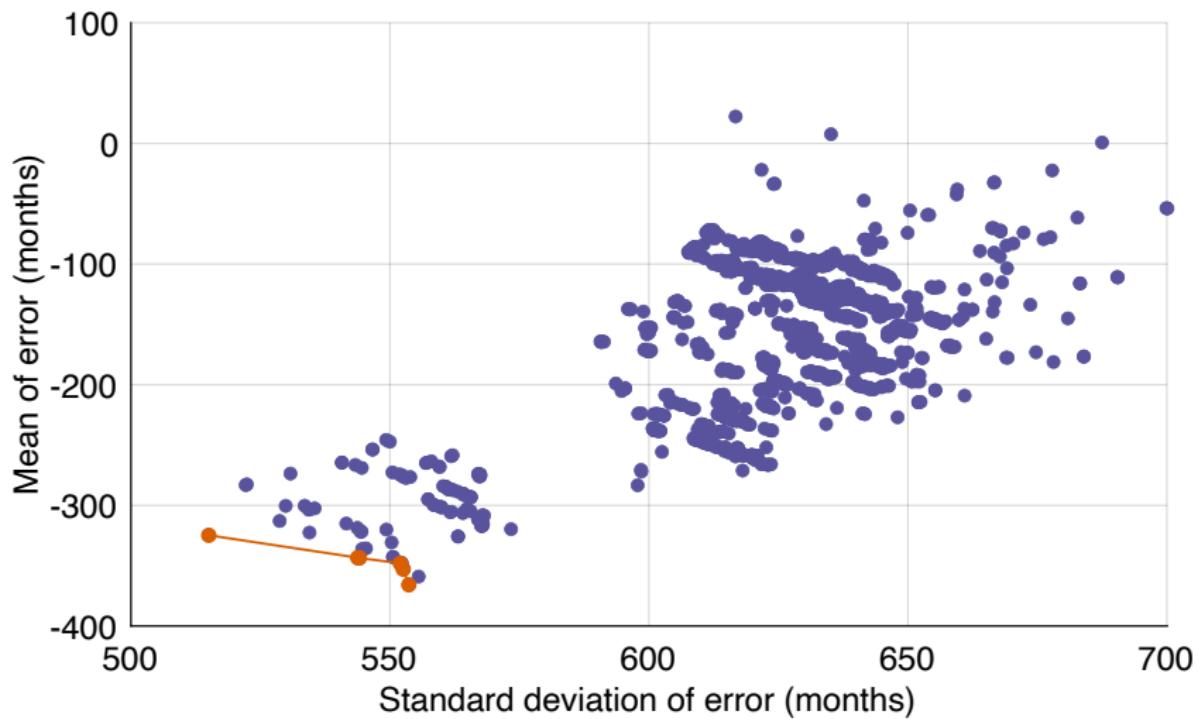


ADDRESSING CONCERNS ABOUT OVERFITTING

PLACEBO TEST: DETECTING DEATHS OF 15 US FIRST LADIES

	First lady	In office	Date of death
1.	Helen Taft	1909–1913	May 1943
2.	Lou Hoover	1929–1933	January 1944
3.	Frances Cleveland	1886–1889, 1893–1897	October 1947
4.	Edith Roosevelt	1901–1909	September 1948
5.	Grace Coolidge	1923–1929	July 1957
6.	Edith Wilson	1915–1921	December 1961
7.	Eleanor Roosevelt	1933–1945	November 1962
8.	Mamie Eisenhower	1953–1961	November 1979
9.	Bess Truman	1945–1953	October 1982
10.	Pat Nixon	1969–1974	June 1993
11.	Jacqueline Kennedy	1961–1963	May 1994
12.	Lady Bird Johnson	1963–1969	July 2007
13.	Betty Ford	1974–1977	July 2011
14.	Nancy Reagan	1981–1989	March 2016
15.	Barbara Bush	1989–1993	April 2018

FRONTIER CLASSIFIERS HAVE PRECISION > 40 YEARS



FRONTIER CLASSIFIERS CANNOT DETECT FIRST-LADY DEATHS

