

$u^* = \sqrt{uv}$: THE FULL-EMPLOYMENT RATE OF UNEMPLOYMENT IN THE UNITED STATES

Pascal Michailat, Emmanuel Saez

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Available at <https://pascalmichailat.org/13/>

US GOVERNMENT'S FULL-EMPLOYMENT MANDATE

- Employment Act of 1946
 - “Policy and responsibility of the federal government...to promote **maximum employment**”
- Federal Reserve Reform Act of 1977
 - Responsibility of the Federal Reserve “to promote effectively the goals of **maximum employment**, stable prices”
- Full Employment and Balanced Growth Act of 1978
 - “Responsibility of the federal government...to foster and promote...**full employment**”
- Goal: compute the **full-employment rate of unemployment (FERU)**

HOW TO INTERPRET LEGAL CONCEPT OF FULL EMPLOYMENT?

- Employment Act of 1946:
 - Full employment allows “to foster ... general welfare”
 - Full Employment and Balanced Growth Act of 1978:
 - Away from full employment, the economy “is deprived of the full supply of goods and services, the full utilization of labor ... and the related increases in economic well-being”
- ~> Full employment = social efficiency
- ~> FERU = efficient rate of unemployment

NAIRU \neq FERU

- Joint Economic Committee (2019):
 - “Today, **full employment** is considered by many to be synonymous with the non-accelerating inflationary rate of unemployment (**NAIRU**)—the rate of unemployment that neither stokes nor slows inflation.”
 - Council of Economic Advisors (2024):
 - “Modern economics has generally defined **full employment** by citing the theoretical concept of the lowest unemployment rate consistent with stable inflation, which is referred to as u^* , ... the non-accelerating inflationary rate of unemployment (**NAIRU**).”
 - But the NAIRU only indicates **price stability** \neq labor-market efficiency
- ~> NAIRU is not an appropriate marker of full employment

NRU \neq FERU

- Boston Fed President Rosengren (2014):
 - Measures the departure of the Fed from its **full-employment mandate** by “the squared deviations of unemployment from an estimate of full employment utilizing the **Congressional Budget Office (CBO) assessment of the natural rate** for each year.”
 - But the CBO’s natural rate of unemployment (NRU) is premised on the **assumption** that the US labor market was at full employment in 2005
- ~> No reason that the NRU is an appropriate marker of full employment

DERIVATION OF THE FERU FORMULA

LABOR AVAILABLE FOR MARKET PRODUCTION = LABOR FORCE

- Employment Act of 1946:
 - “Promote employment opportunities for those able, willing, and seeking to work”
- Pool of workers that can be tapped for market production: labor force
 - People out of the labor force: in school or training, retired, looking after their family
- Labor force is assumed to be exogenous
 - Participation rate is acyclical (Rees 1957; Shimer 2009; Rogerson, Shimer 2011)
- But formula $u^* = \sqrt{uv}$ remains valid even if labor-force participation is endogenous, by an envelop-theorem logic

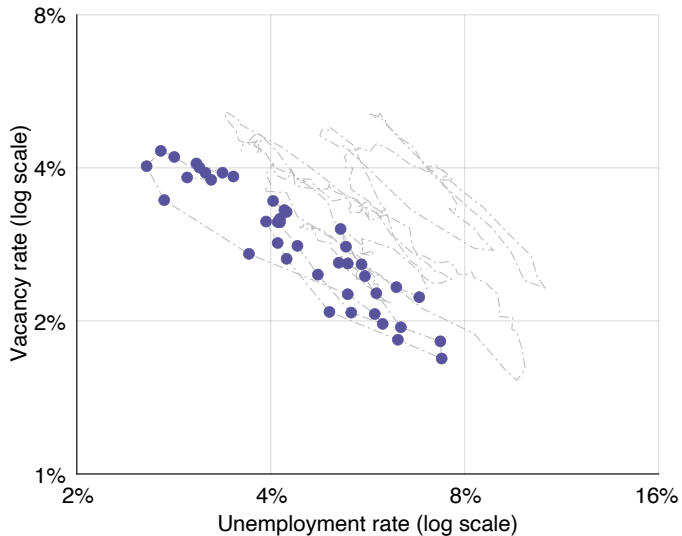
SOCIAL PRODUCT OF UNEMPLOYED LABOR ≈ 0

- Share u of labor force is unemployed
- Contributions to social output:
 - Zero from jobseeking
 - Positive from home production
 - Negative from idleness: psychosocial cost of unemployment
- Psychosocial cost of unemployment offsets home production (Borgschulte, Martorell 2018)
 - ~> Social product of unemployed labor = 0
- Mechanisms behind large psychosocial cost of unemployment:
 - Loss of daily routine, of regular social interactions, of overarching goals, of personal status & identity (Jahoda 1981)

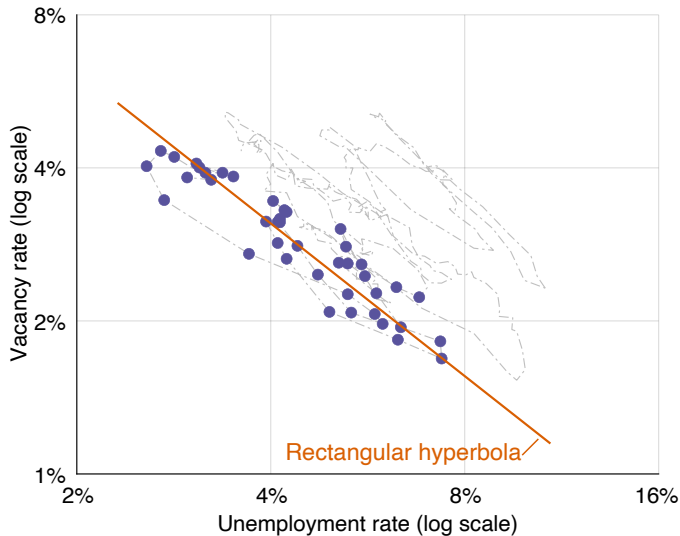
SOCIAL PRODUCT OF EMPLOYED LABOR

- Share v of labor force is employed and recruiting
 - ~> Social product of recruiting = 0
- Share $1 - (u + v)$ of labor force is employed and producing
 - ~> Social product of producing > 0
- Number of recruiters can be measured by number of vacancies:
 - National Employer Survey in 1997 (Villena Roldan 2010)
 - Bersin survey in 2011 (Gavazza, Mongey, Violante 2018)
 - ~> 1 vacancy requires ≈ 1 full-time recruiter

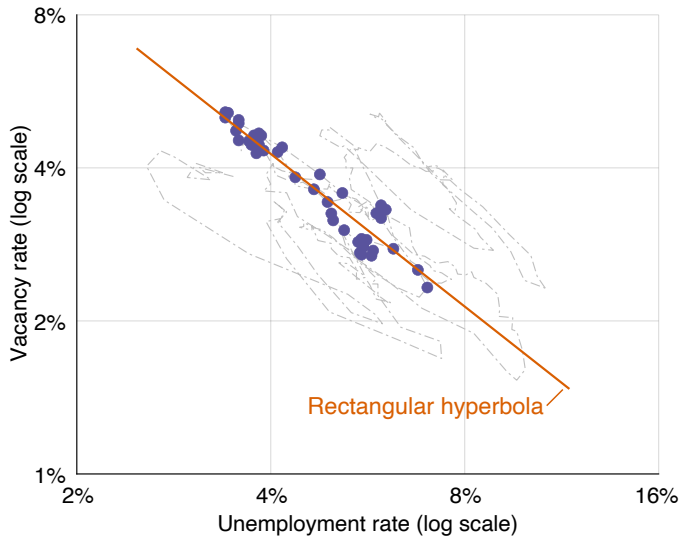
BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 1951–1961



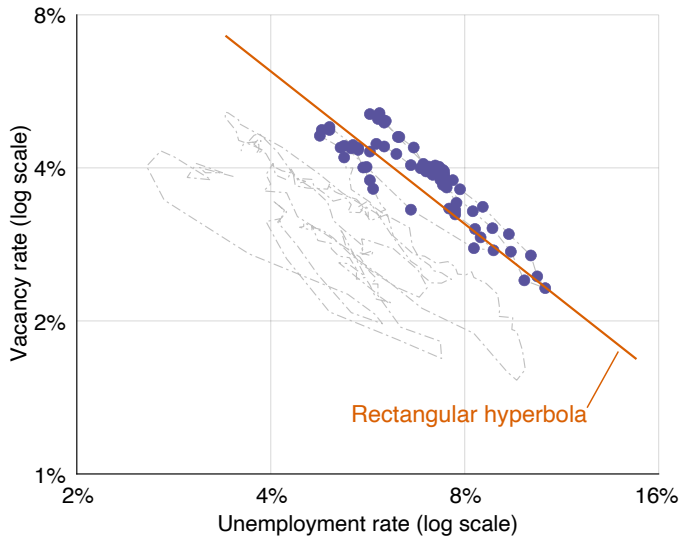
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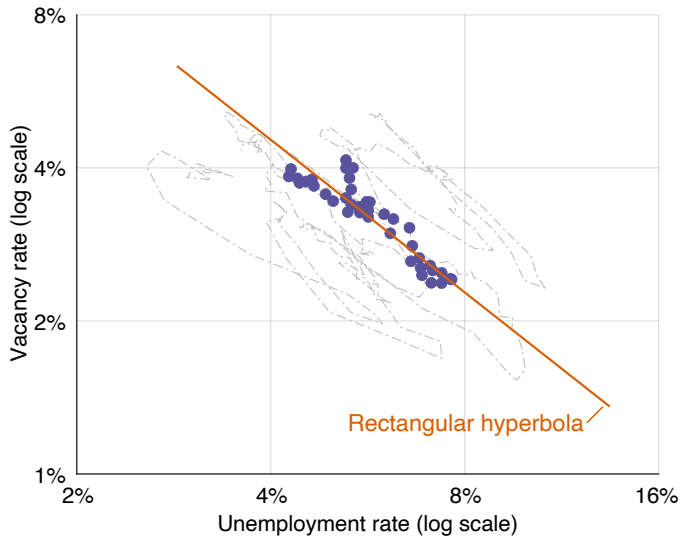
BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 1961–1971



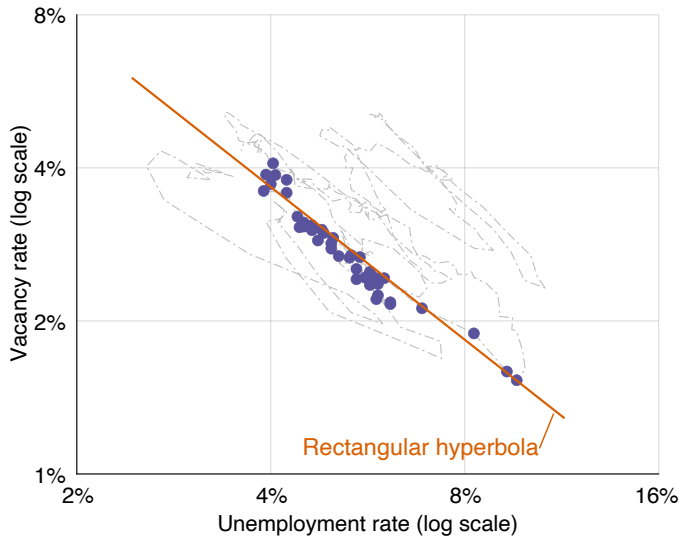
BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 1972–1989



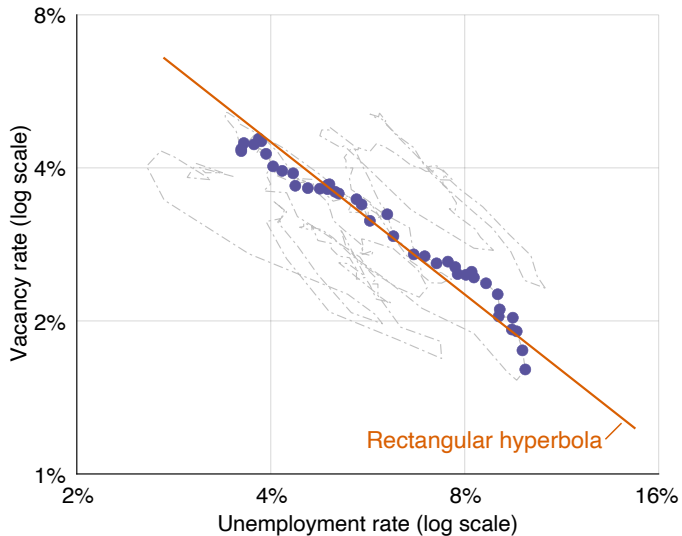
BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 1989–1999



BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 1999–2009



BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA: 2009–2019



COMPUTING THE FERU

- Planner's objective: minimize **nonproductive use of labor** $u + v$
 - Unemployment rate u : value of home production & recreation is offset by psychosocial cost of unemployment
 - Vacancy rate v : 1 vacancy requires 1 worker devoted to recruiting
- Subject to **hyperbolic Beveridge curve** $u \times v = A$
 - u and v cannot be reduced simultaneously
- First-order condition gives efficient unemployment rate u^* :

$$\frac{d[u + A/u]}{du} = 0 \Rightarrow 1 - A/(u^*)^2 = 0 \Rightarrow u^* = \sqrt{A}$$

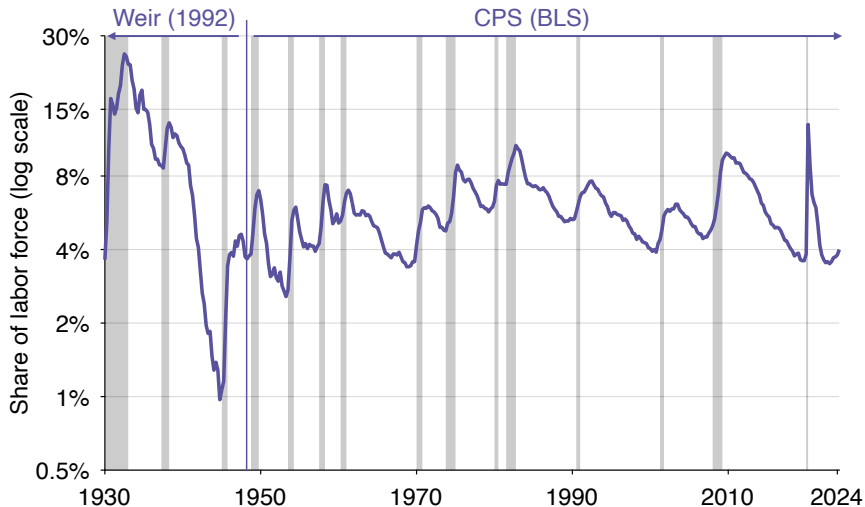
- ~> FERU is geometric average of u and v : $u^* = \sqrt{uv}$
- FERU is > 0 , determined by location of Beveridge curve

CRITERION FOR FULL EMPLOYMENT

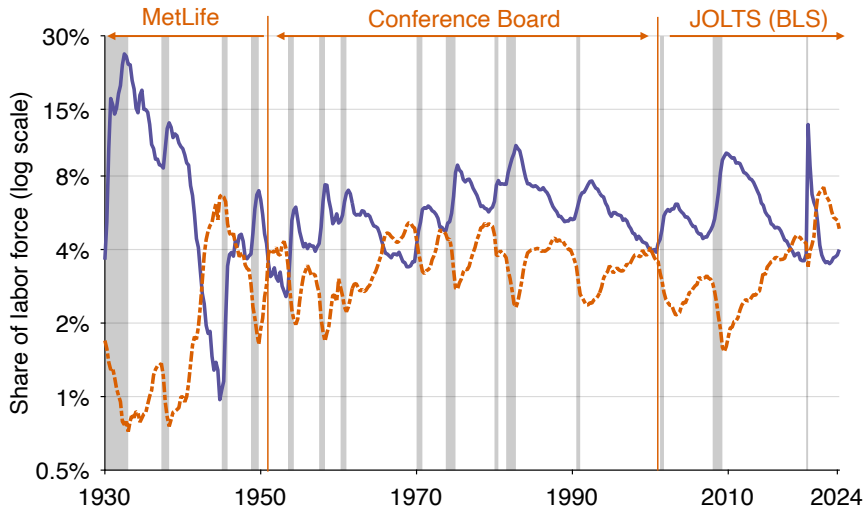
- Economy is at full employment when $u = u^* = \sqrt{uv}$
 \leadsto At full employment when $u = v$
- Economy is inefficiently slack when $u > u^* = \sqrt{uv}$
 \leadsto Inefficiently slack when $u > v$
- Economy is inefficiently tight when $u < u^* = \sqrt{uv}$
 \leadsto Inefficiently tight when $u < v$

FERU IN THE UNITED STATES, 1930–2024

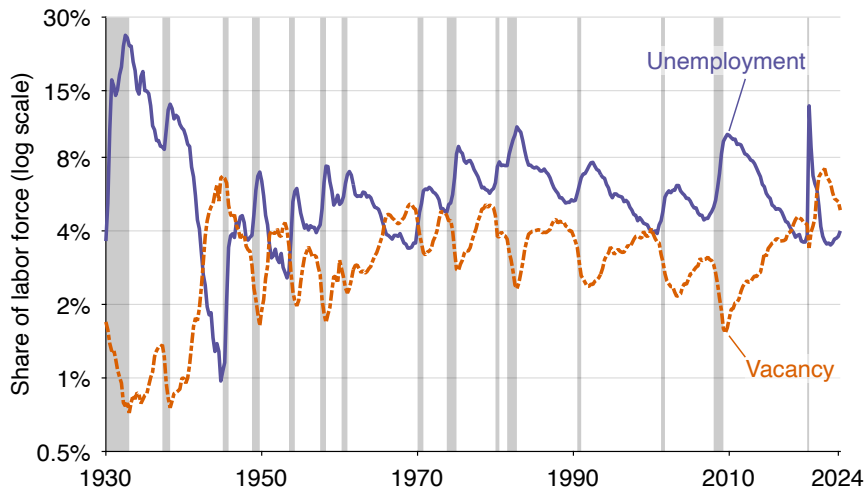
US UNEMPLOYMENT RATE (PETROSKY-NADEAU & ZHANG 2021)



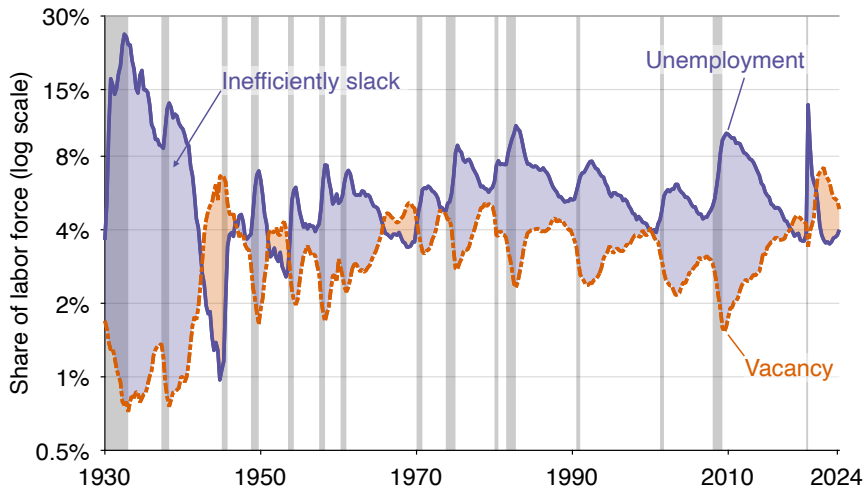
US VACANCY RATE (PETROSKY-NADEAU & ZHANG 2021)



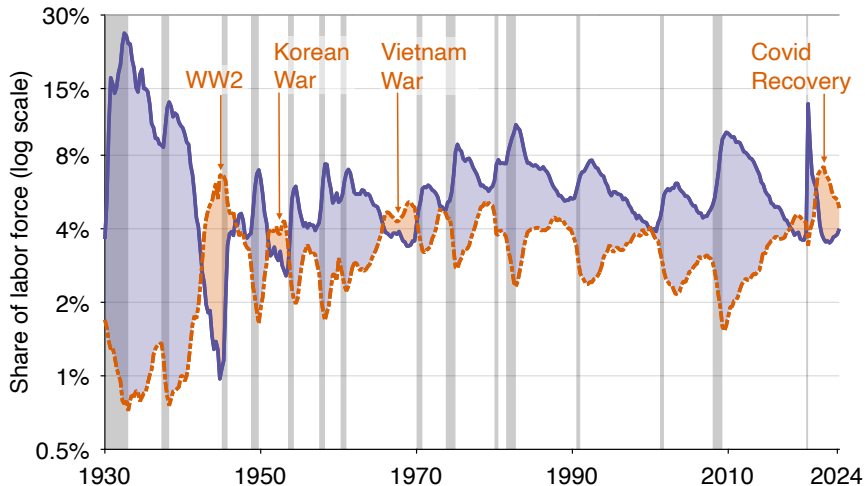
SYMMETRICAL MOVEMENTS OF U & V INDICATE AGAIN THAT US
BEVERIDGE CURVE \approx RECTANGULAR HYPERBOLA



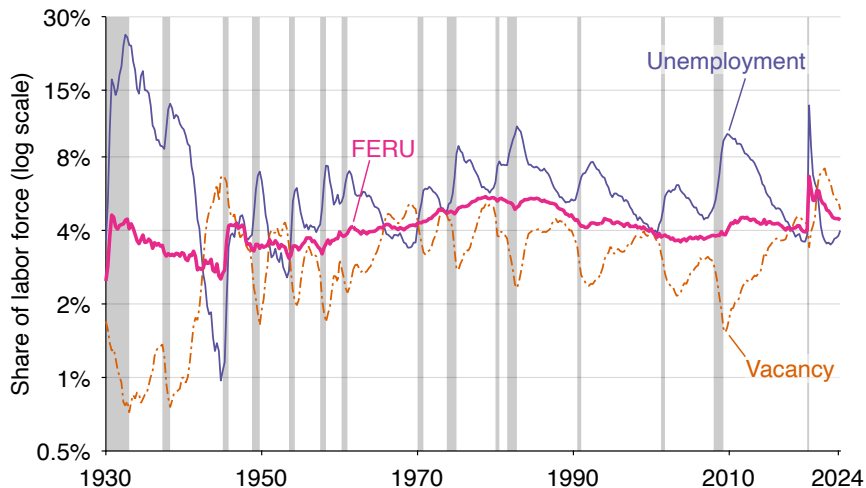
LABOR MARKET IS GENERALLY TOO SLACK



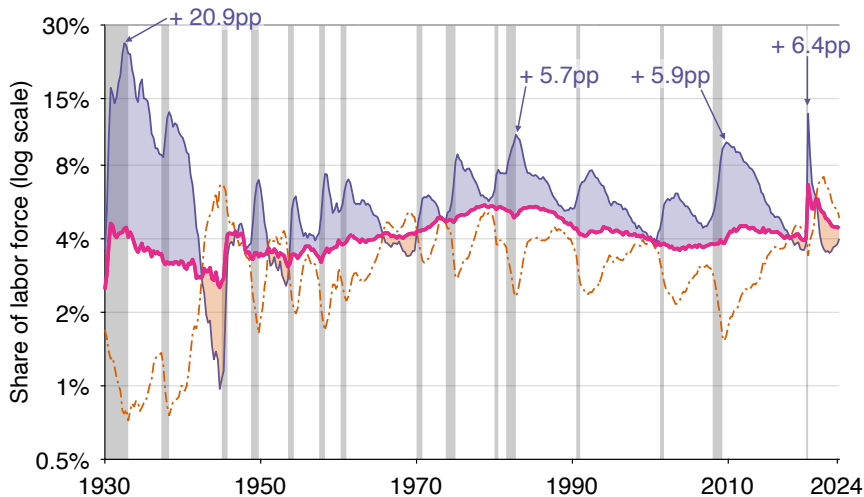
LABOR MARKET IS TOO TIGHT DURING WARS



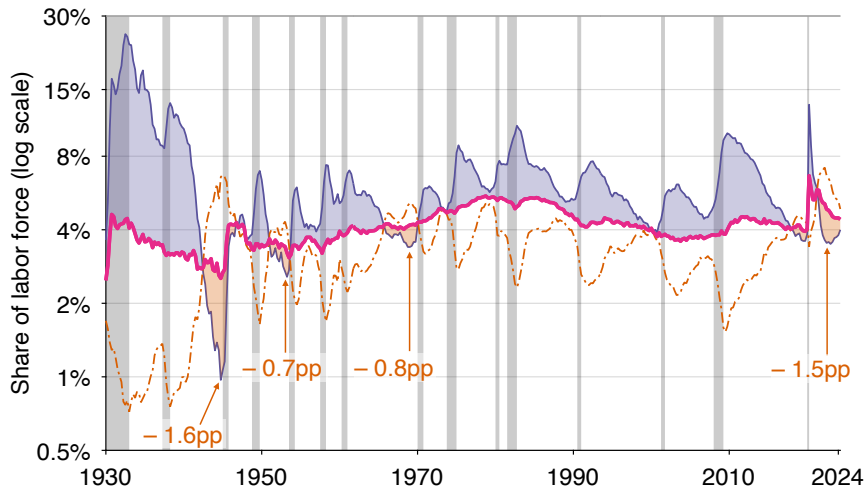
FERU $u^* = \sqrt{uv}$ AVERAGES 4.1% AND IS STABLE



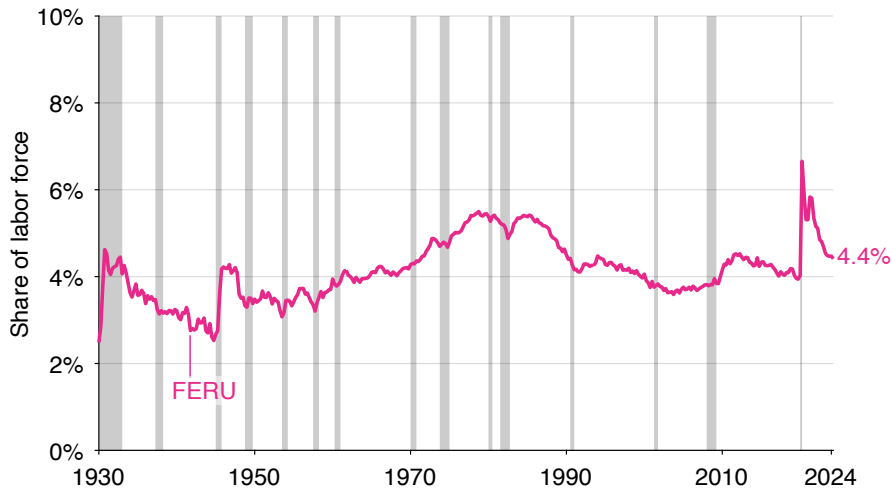
UNEMPLOYMENT GAP IS COUNTERCYCLICAL



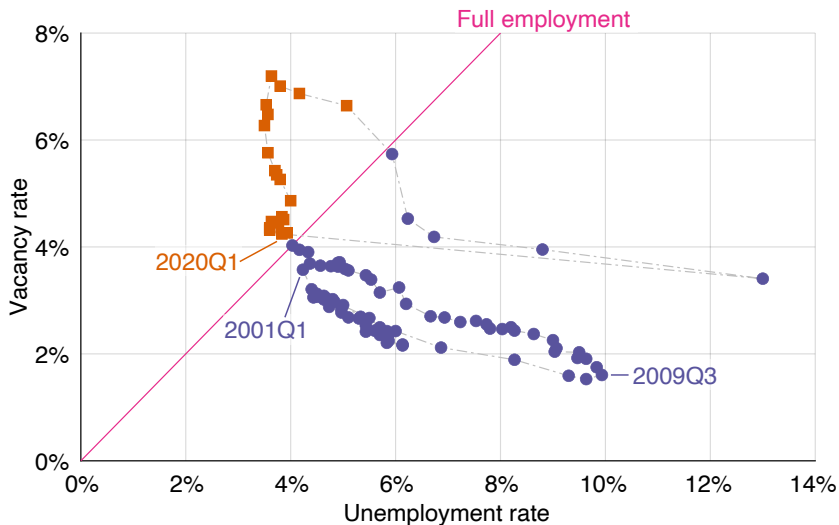
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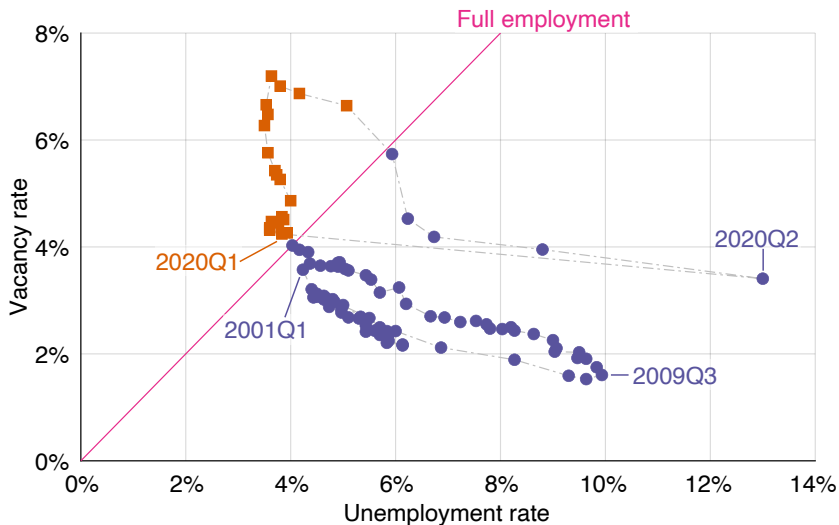
CURRENT TARGET FOR MONETARY POLICY: $u^* = 4.4\%$



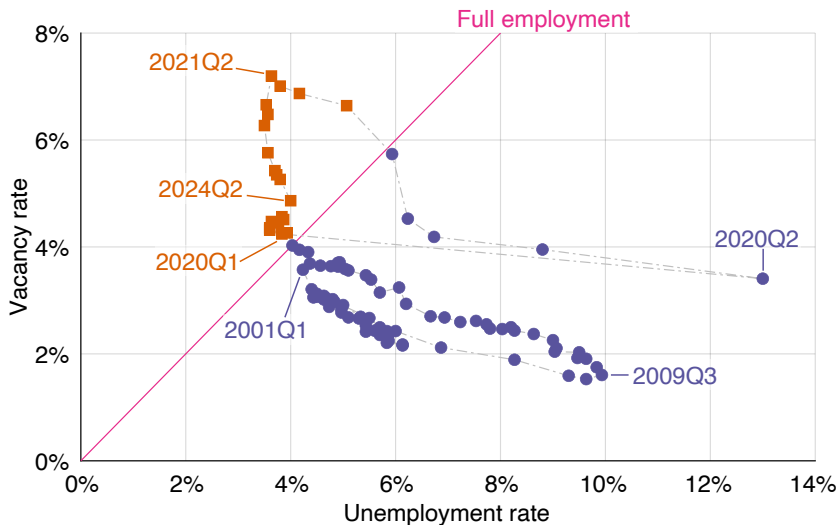
WHY DID THE FERU INCREASE SO MUCH IN 2020? BECAUSE
THE BEVERIDGE CURVE SHIFTED OUTWARD IN 2020Q2



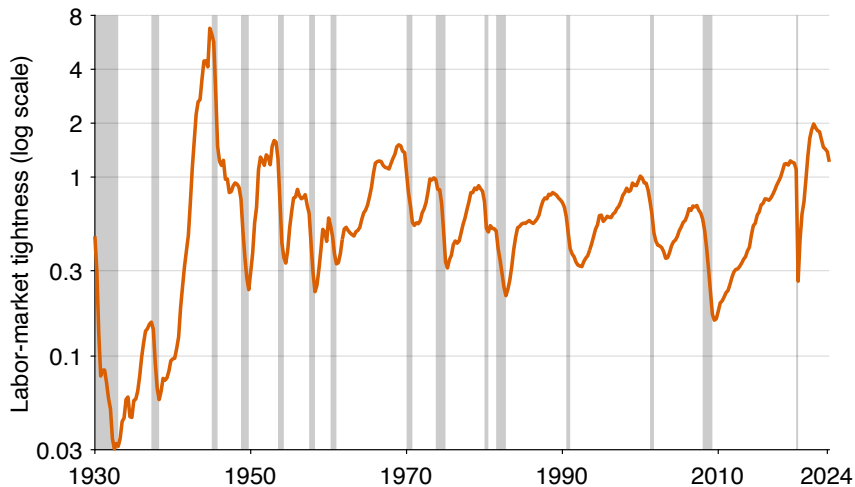
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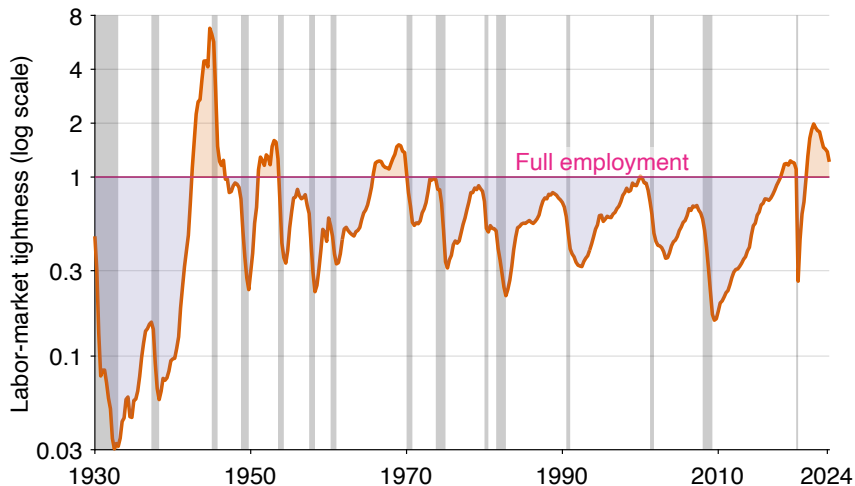
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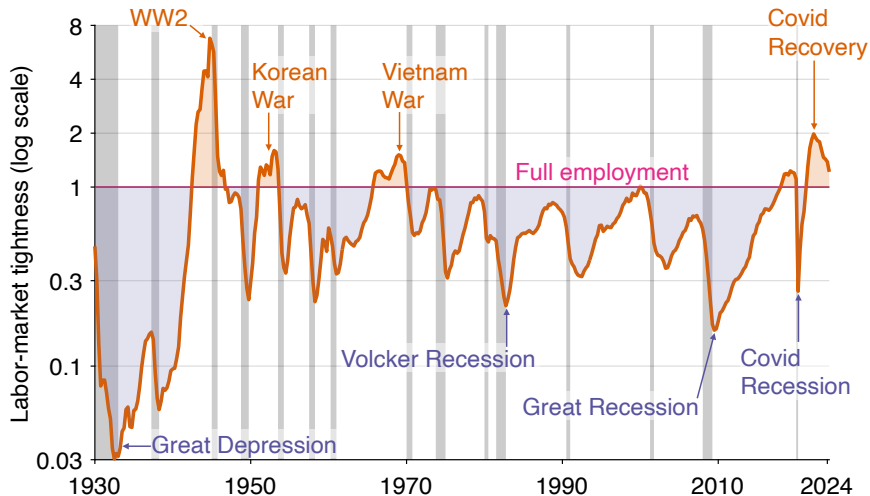
TIGHTNESS v/u SUMMARIZES STATE OF LABOR MARKET



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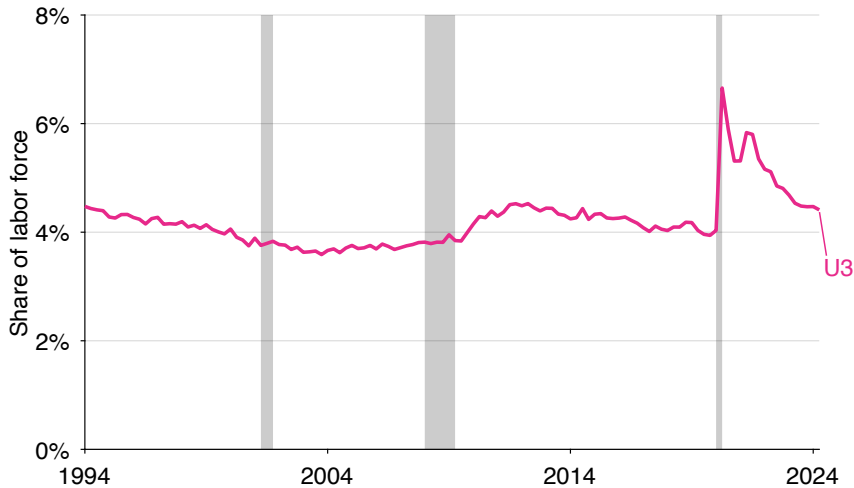


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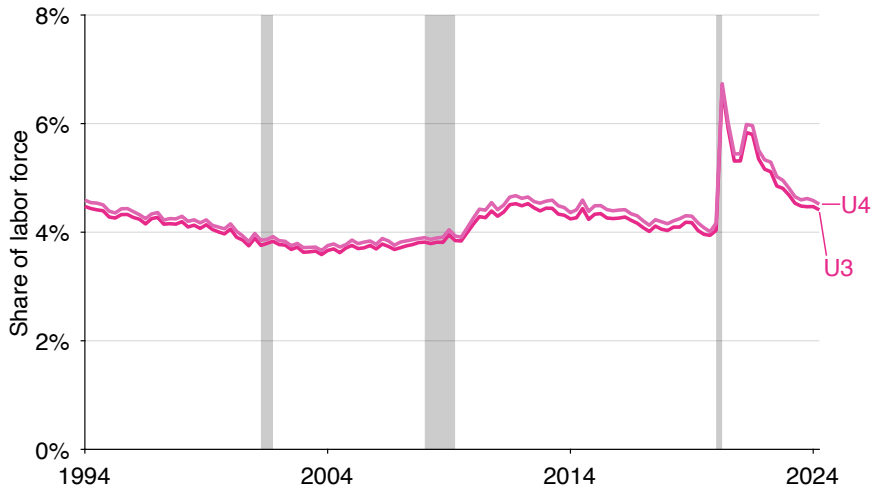


ROBUSTNESS OF THE FERU

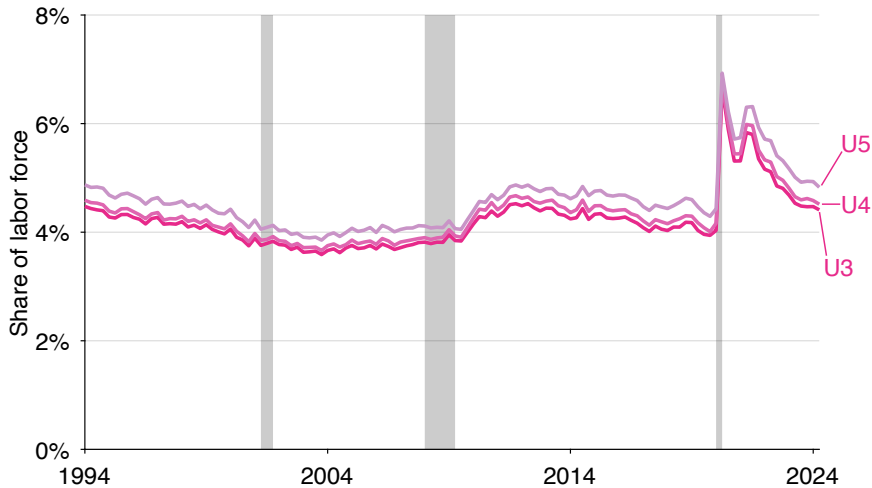
FERU WITH DIFFERENT MEASURES OF UNEMPLOYMENT



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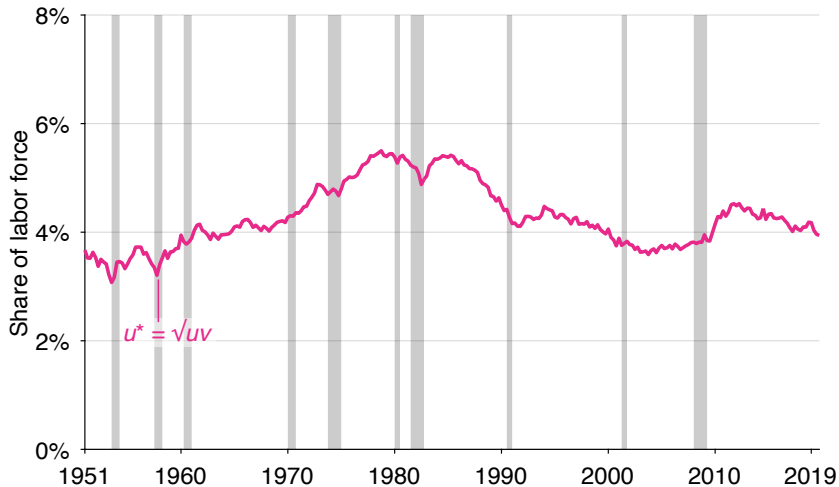
GENERALIZED FERU FORMULA (MICHAILLAT, SAEZ 2021)

- Social product of unemployed labor: $0 \rightarrow \zeta$
- Number of recruiters per vacancy: $1 \rightarrow \kappa$
- Elasticity of Beveridge curve: $v = A/u \rightarrow v = A/u^\epsilon$
- Generalized FERU formula:

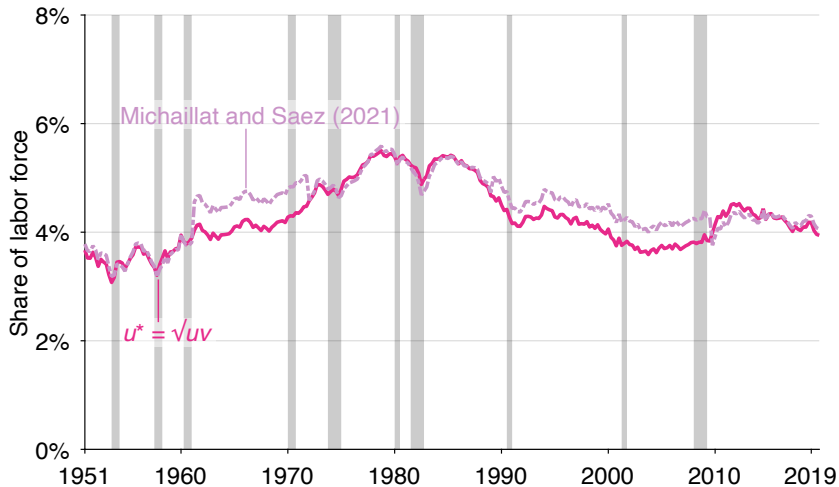
$$u^* = \sqrt{uv} \quad \rightarrow \quad u^* = \left(\frac{\kappa \cdot \epsilon}{1 - \zeta} \cdot u^\epsilon \cdot v \right)^{1/(1+\epsilon)}$$

- Calibration for US economy:
 - $\zeta = 0.26$
 - $\kappa = 0.92$
 - $\epsilon \in [0.84, 1.02]$, given by Bai, Perron (1998) algorithm

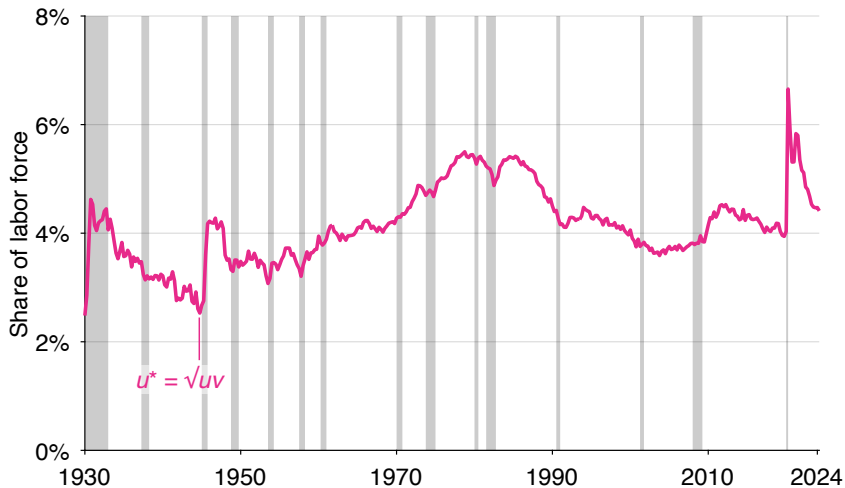
SIMPLE VERSUS GENERALIZED FERU FORMULA



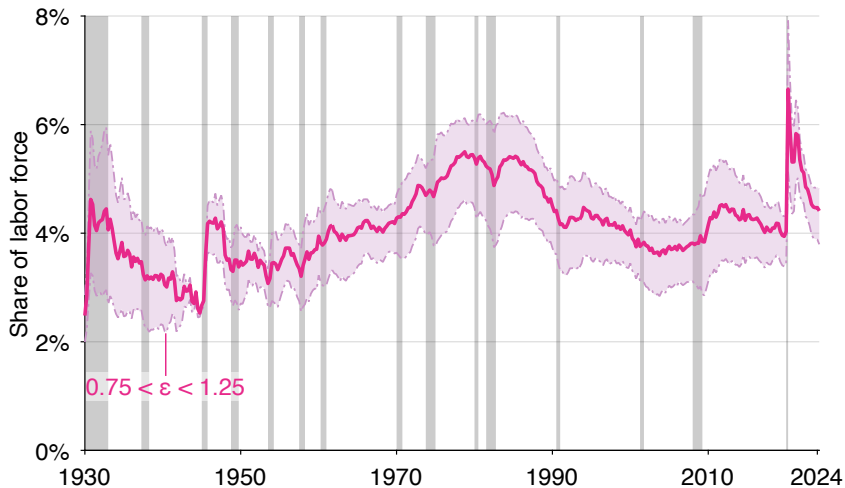
SIMPLE VERSUS GENERALIZED FERU FORMULA



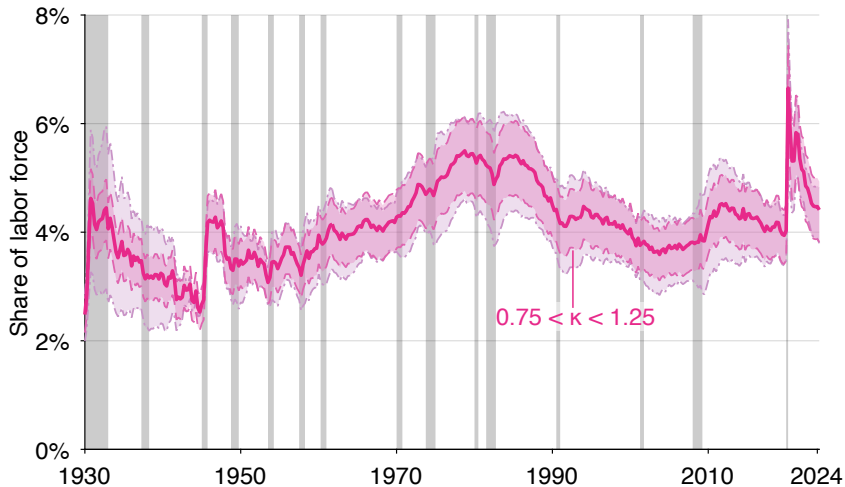
INSENSITIVITY OF GENERALIZED FERU TO PARAMETER VALUES



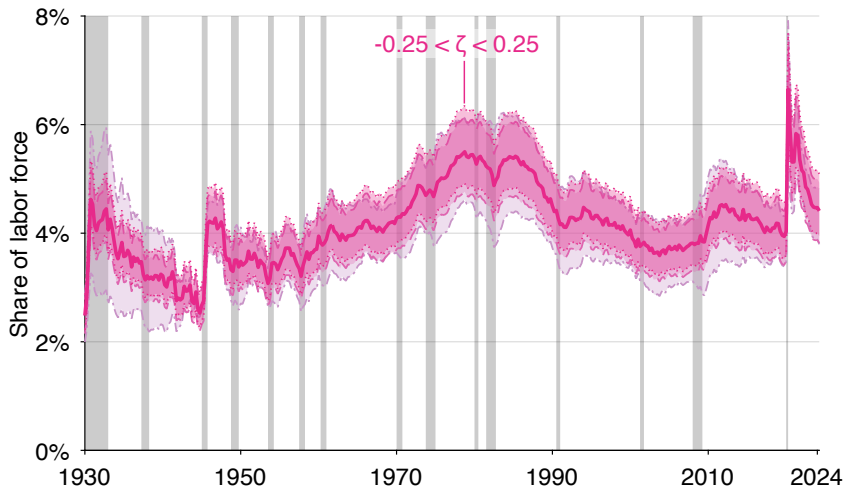
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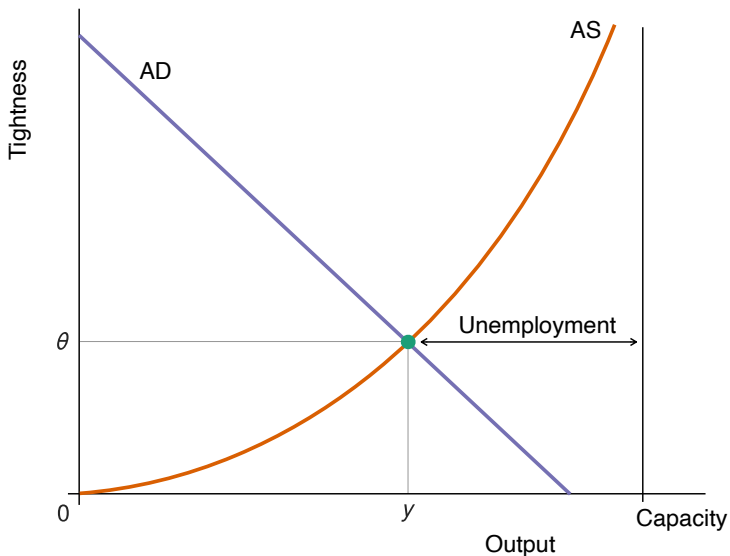


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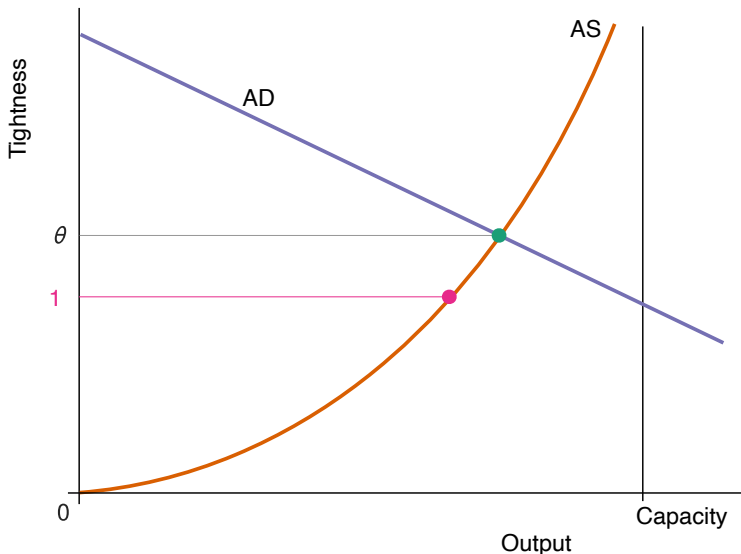


APPLICATION OF FERU TO MONETARY POLICY

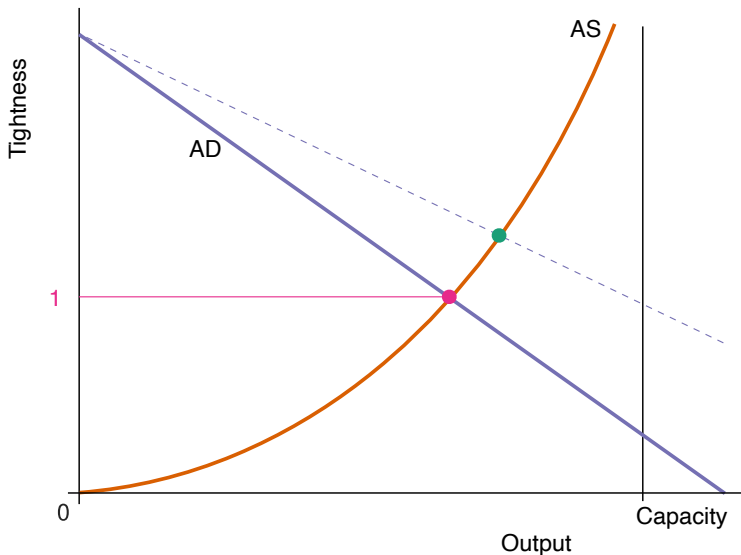
THE FED CAN ACHIEVE FULL EMPLOYMENT IN BOOMS BY RAISING INTEREST RATES (MICHAILLAT, SAEZ 2022)



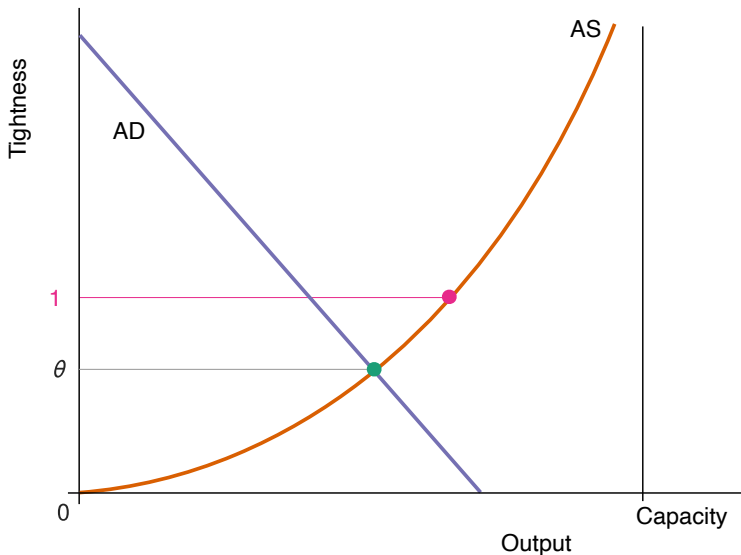
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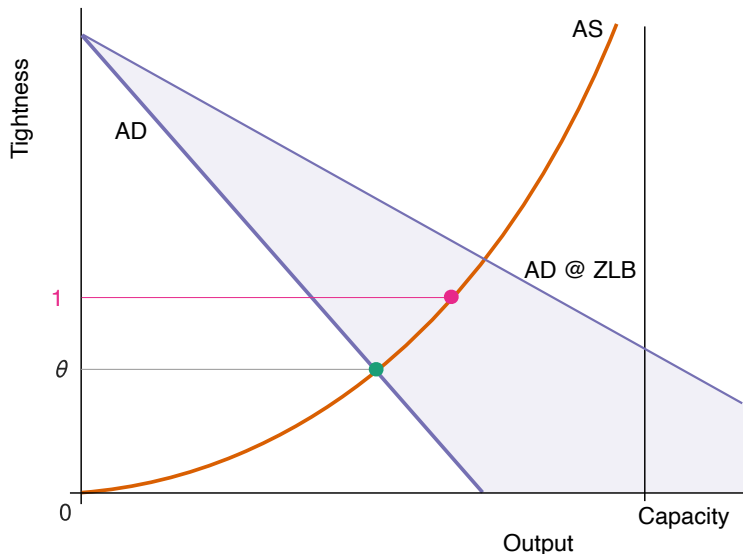
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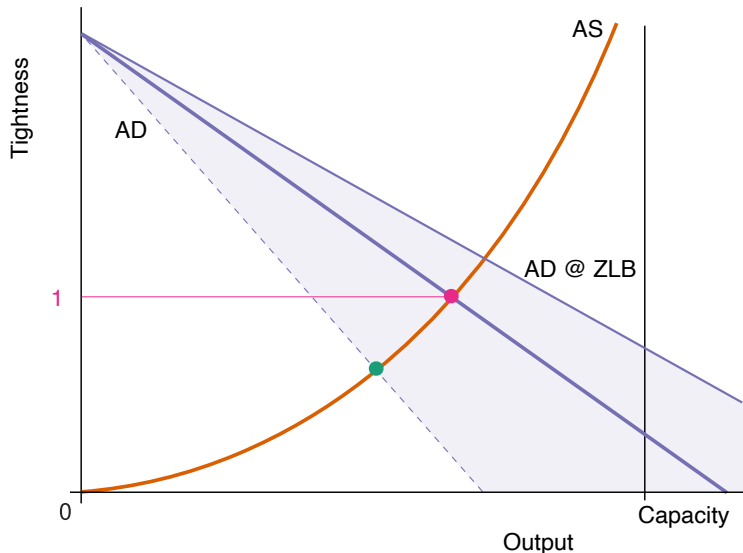
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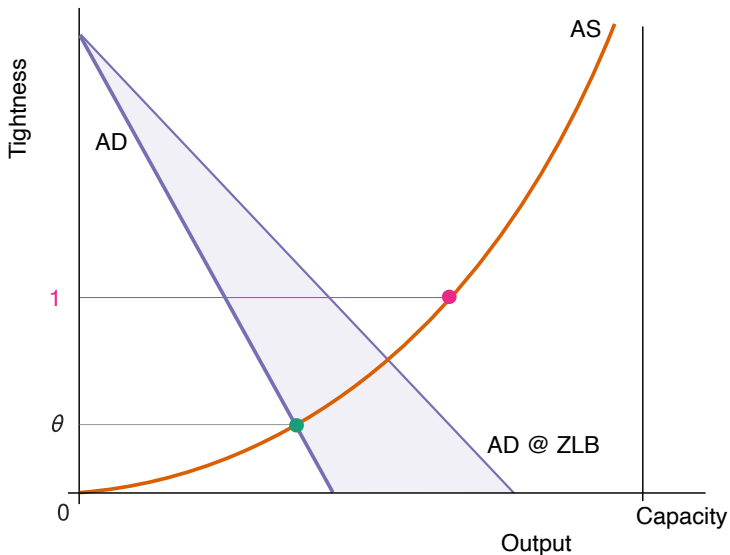
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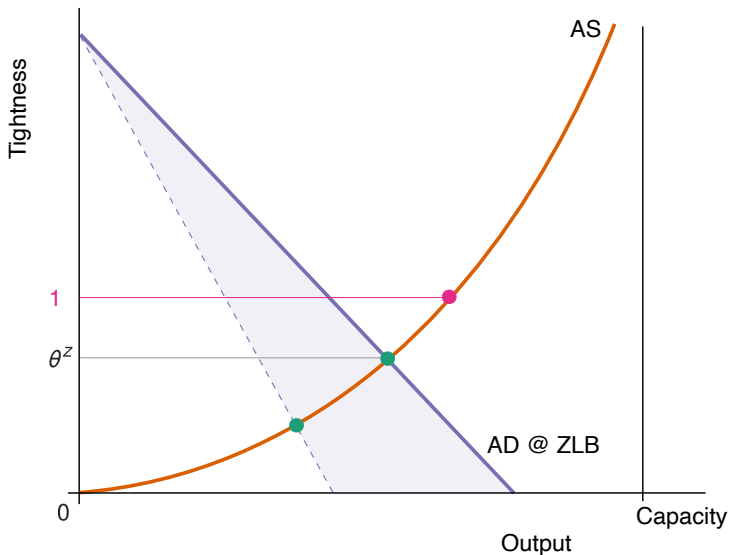
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BUT THE FED CANNOT ACHIEVE FULL EMPLOYMENT IN LARGE SLUMPS BECAUSE OF THE ZLB (MICHAILLAT, SAEZ 2022)



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WHEN IS IT OPTIMAL FOR THE FED TO TARGET THE FERU?

- Targeting u^* is optimal with **fixed inflation** (Michaillat, Saez 2022)
- Targeting u^* is also optimal when inflation is endogenous but the **divine coincidence holds** (Michaillat, Saez 2024)
- Then, if the current nominal interest rate is r and the current unemployment gap is $u - u^*$, the optimal nominal interest rate r^* is:

$$r - r^* \approx \frac{u - u^*}{du/dr}$$

- In the US, the monetary multiplier $du/dr \approx 0.5$ (Michaillat, Saez 2022)
- Fed should reduce interest rates by 2 percentage points for each percentage point of unemployment gap
- In line with observed Fed behavior (Bernanke, Blinder 1992)

HOW TO USE THE FERU IF DIVINE COINCIDENCE FAILS?

- Social planner minimizes welfare loss subject to Phillips curve
- Approximate welfare loss around efficient allocation (u^*, π^*) :

$$\mathcal{L}(u, \pi) = (\pi - \pi^*)^2 + \alpha (u - u^*)^2$$

- Approximate Phillips curve, with $\gamma \neq 0$ to break divine coincidence:

$$\pi - \pi^* = -\beta (u - u^*) + \gamma$$

- At the optimum, unemployment and inflation gaps satisfy:

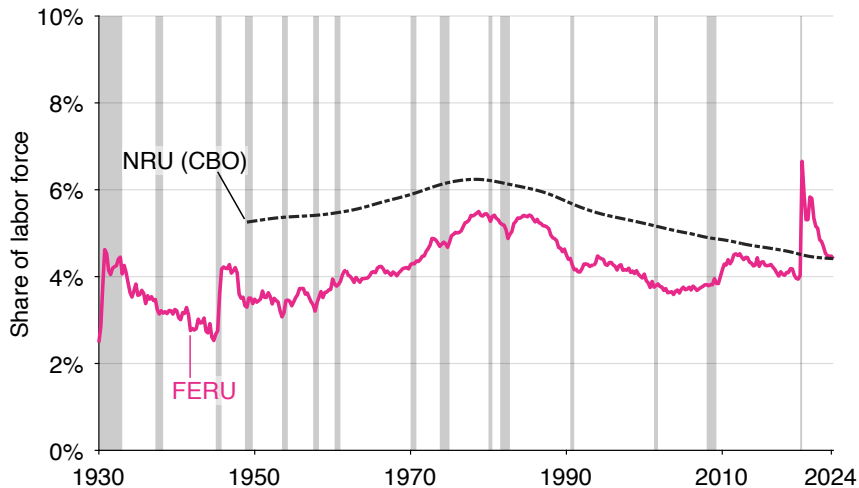
$$\frac{u - u^*}{\pi - \pi^*} = \frac{\beta}{\alpha} > 0$$

- Fed trades off unemployment and inflation gaps

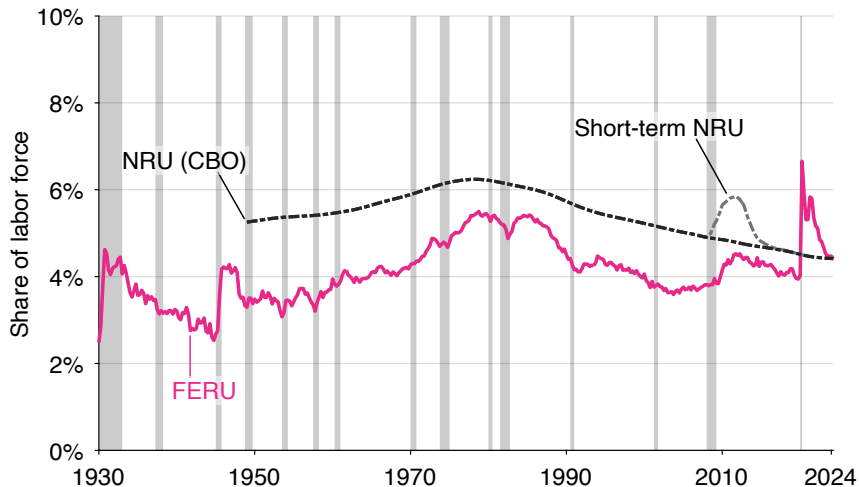
⇒ Targeting u^* is no longer optimal, but u^* influences optimal policy

WHY HAS THE US LABOR MARKET BEEN SO SLACK IN
THE PAST CENTURY?

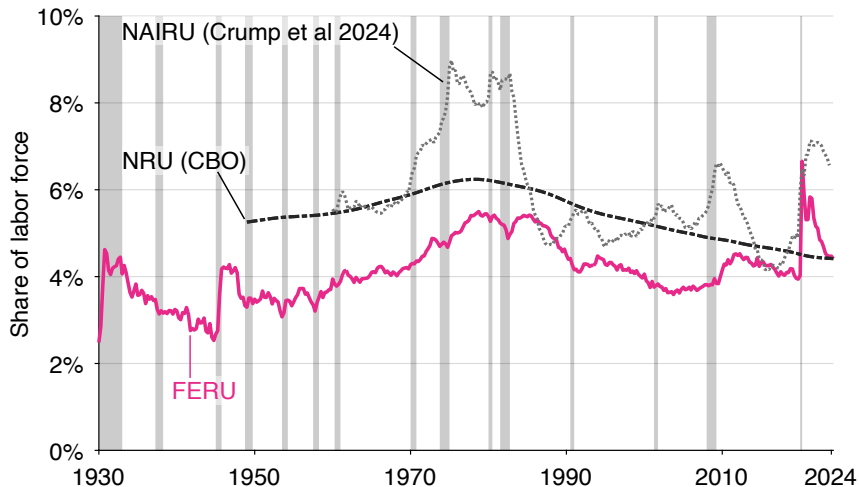
FERU IS LOWER THAN EXISTING UNEMPLOYMENT TARGETS



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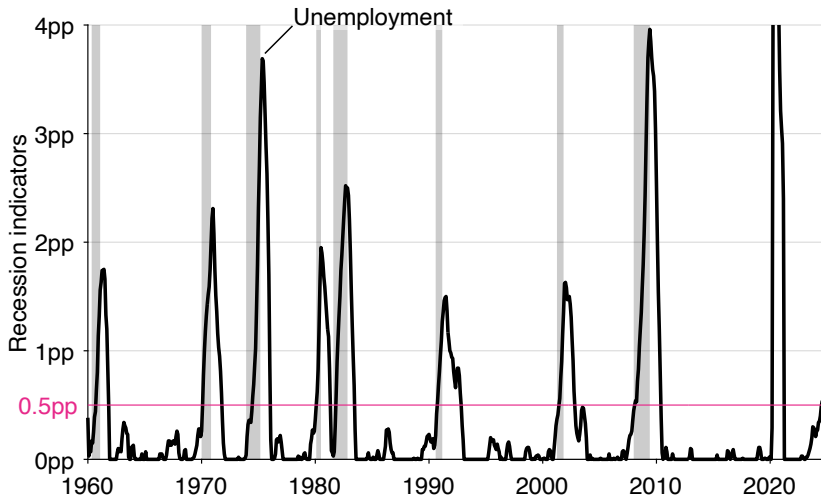


OTHER REASONS FOR INEFFICIENT SLACKNESS

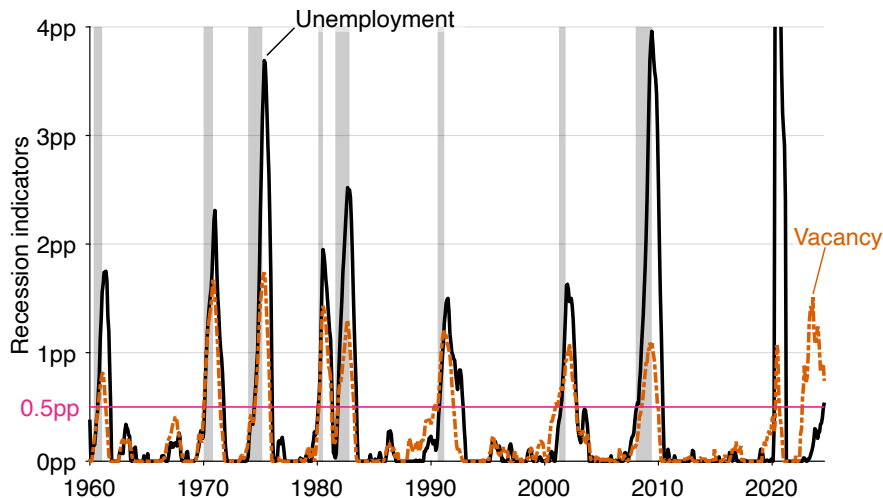
- Great Depression:
 - Gold standard (Eichengreen, Temin 2000)
 - Policy errors (Friedman, Schwartz 1963)
- Volcker–Greenspan era:
 - Priority given to inflation (Thornton 2011; Kaya et al 2019)
 - Maybe due to pressure from Congress (Hess, Shelton 2016)
- Great Recession, pandemic:
 - Zero lower bound (ZLB) (Michaillat, Saez 2022)

ANOTHER APPLICATION OF UNEMPLOYMENT & VACANCY DATA: DETECTING RECESSIONS

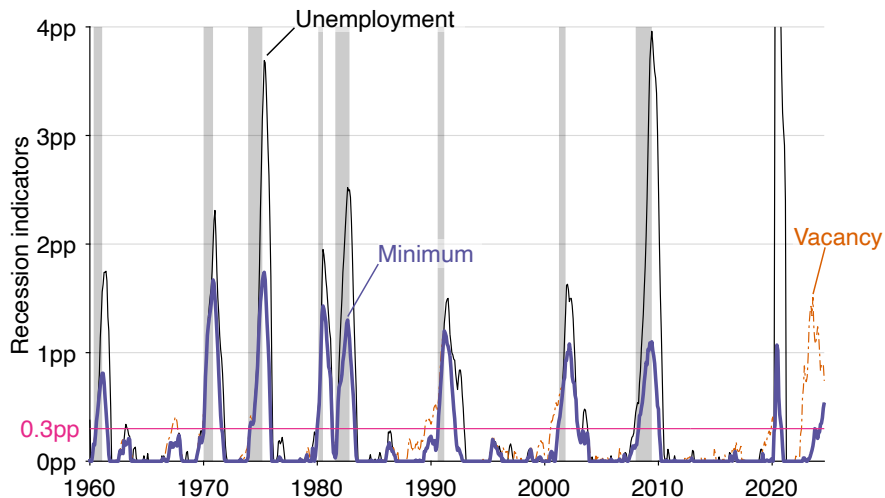
DETECTING RECESSIONS WITH UNEMPLOYMENT: SAHM RULE



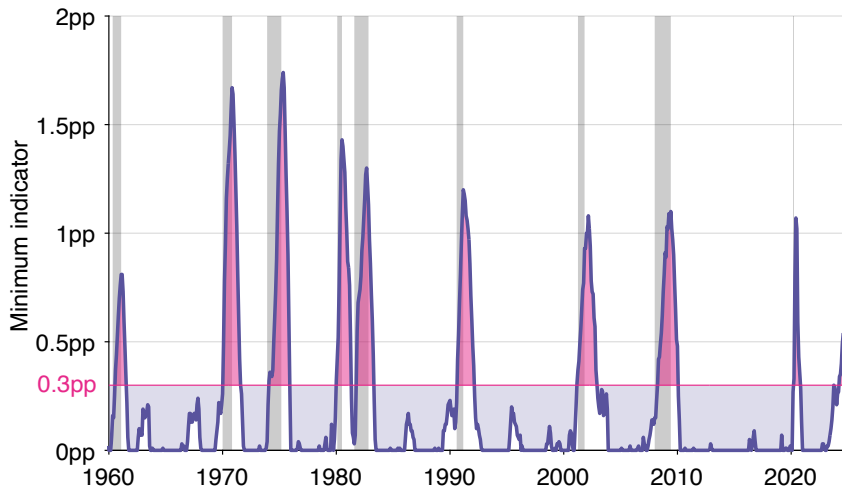
DETECTING RECESSIONS WITH UNEMPLOYMENT & VACANCIES: MICHEZ RULE (FT)



DETECTING RECESSIONS WITH UNEMPLOYMENT & VACANCIES: MICHEZ RULE (FT)



RECESSION MAY HAVE STARTED AS EARLY AS MARCH 2024



MICHEZ RULE PERFECTLY DETECTS 15 RECESSIONS SINCE 1929

