# $u^* = \sqrt{uv}$ : The full-employment rate of UNEMPLOYMENT IN THE UNITED STATES

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# 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<sup>\*</sup>, ... the non-accelerating inflationary rate of unemployment (NAIRU)."
- But the NAIRU indicates price stability ≠ labor market efficiency
- → NAIRU ≠ 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 NRU = appropriate marker of full employment

# DERIVATION OF FERU FORMULA

#### LABOR AVAILABLE FOR MARKET PRODUCTION = LABOR FORCE

- Employment Act of 1946:
  - "Promote employment opportunities for those able, willing, and seeking to work"
- 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
- Participation rate is acyclical (Rees 1957; Shimer 2009; Rogerson, Shimer 2011)
  - $\sim$  Labor force is exogenous
    - 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 of unemployed labor to social output:
  - Contribution from jobseeking = 0
  - Contribution from home production > 0
  - Contribution from idleness < 0: psychosocial cost</li>
- Psychosocial cost of unemployment offsets home production (Borgschulte, Martorell 2018; Hussam et al 2022)
  - → Social product of unemployed labor = 0
- Various mechanisms behind large 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
  - $\sim$  Social product of recruiting = 0
- Share 1 (u + v) of labor force is employed and producing
  - $\sim$  Social product of producing > 0
- 1 vacancy requires 1 full-time recruiter
  - National Employer Survey in 1997 (Villena Roldan 2010)
  - Bersin survey in 2011 (Gavazza, Mongey, Violante 2018)
  - Number of recruiters = number of vacancies

#### BEVERIDGE CURVE IS A RECTANGULAR HYPERBOLA: 1951-1961



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#### BEVERIDGE CURVE IS A RECTANGULAR HYPERBOLA: 1989–1999



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#### BEVERIDGE CURVE IS A 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 × v = A
  - u and v cannot be reduced simultaneously
- First-order condition gives efficient unemployment rate *u*\*:

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

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



# MIRROR MOVEMENTS OF U & V INDICATE AGAIN THAT US BEVERIDGE CURVE IS A 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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# TIGHTNESS v/u summarizes state of labor market



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# **ROBUSTNESS OF US 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:
  - $-\zeta = 0.26$
  - $-\kappa = 0.92$
  - $-\ \varepsilon \in [$  0.84, 1.02], given by Bai, Perron (1998) algorithm

#### FERU FORMULA: SIMPLE $\approx$ GENERALIZED



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# APPLICATION OF FERU TO MONETARY POLICY

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



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



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

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

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

- In the US, 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 FERU IF DIVINE COINCIDENCE FAILS?

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

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

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

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

• 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 (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

