

# A New Method for Estimating Time Variation in the NAIRU

William T. Dickens  
Northeastern University  
and  
The Brookings Institution  
June 11, 2008

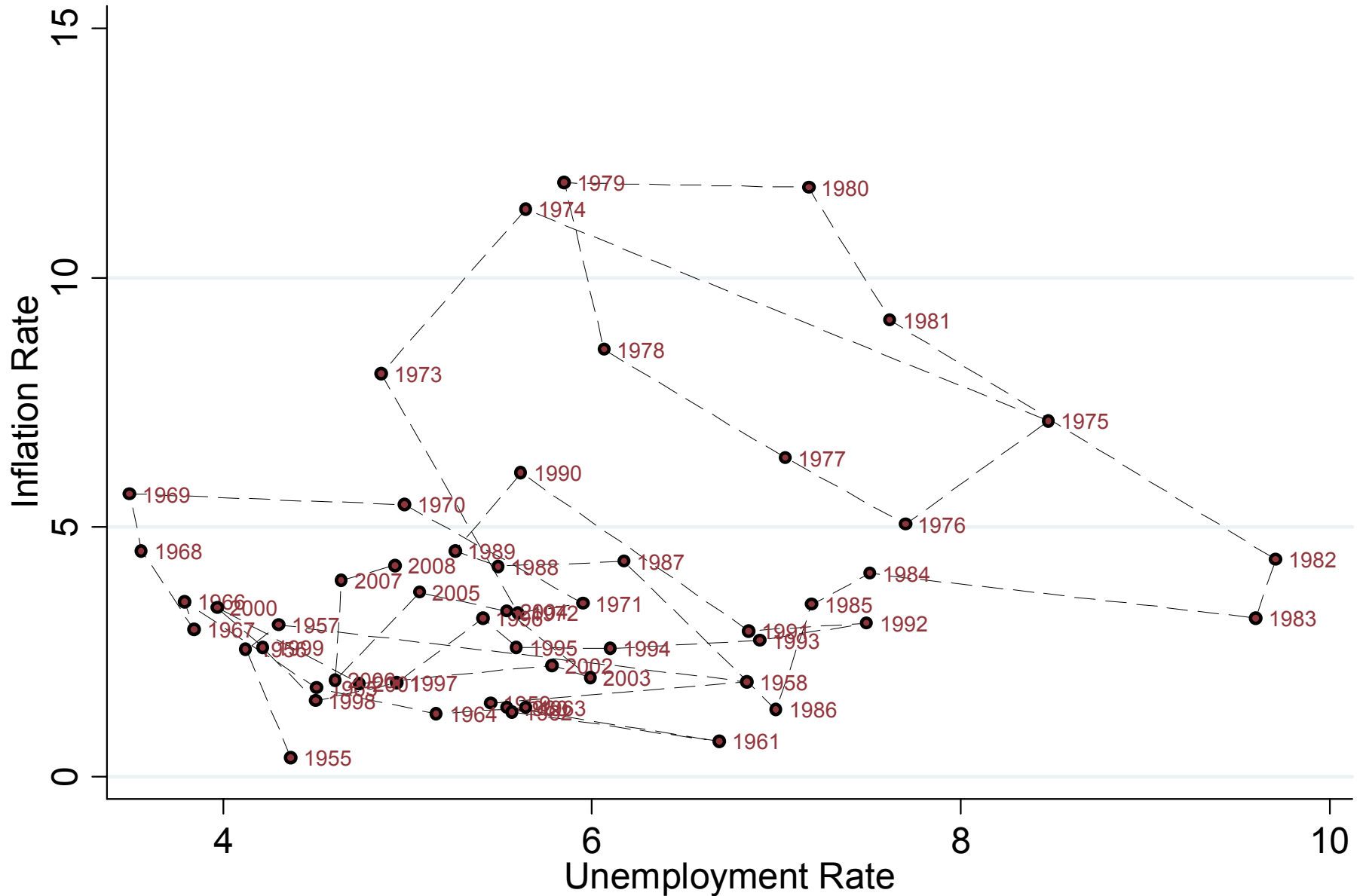
“One need is to better way to track the deviation of GDP from potential output in real time.”

Chairman Bernanke, June 10 2008

# NAIRU Estimates Come From Estimating Phillips Curves

- In theory there is a level of unemployment and any time unemployment is below that level inflation is increasing
- Any time inflation is above that level it is decreasing
- So look at a scatter plot of inflation and unemployment and how it is trending and it should be easy to spot this point...
- Right?

# Phillips Curve 1954-1996, 2001-2007



... OK... Good Luck With That...

# Actually Phillips Curve Story is a Good Deal More Complicated

- You have inflationary expectations shifting the intercept with long (and variable?) lags
- Some have argued that the rate of change in unemployment also plays a role in determining the inflation rate
- Perhaps worst of all, the NAIRU may not sit still long enough to take its picture

*Its Hard to Hit a Moving Target*

# The Moving Target

- Perry (1970) demographics affect NAIRU
- Gordon has had NAIRU shifts in his text book PC for two decades at least
- Abraham (1987) had suggested that the NAIRU was probably lower in the 1960s than in the 1970s and 1980s
- Lots of Johnnie-come-latelies (Ball and Mankiw 2002, Cohen, Dickens and Posen 2001, Stock 2001, Gordon 1997&1998)

# How to track it?

- Initially Perry just did demographic adjustment
- When it looked like the 60s were very different from the 70s and 80s (and supply shocks weren't enough to explain it) people put dummy variables connected by trends in for the one big shift
- When it seemed in the 90s that it was dropping again people adopted more sophisticated ways to identify TV-NAIRU (trend-breaks, non-linear trends, Kalman filters) (Staiger, Stock and Watson (1997) and Gordon (1997,1998) and Stock and Watson (1999))

# Problem is, It /s Hard to Hit a Moving Target

- Staiger, Stock and Watson (1997) conclude that results have such large standard errors and are so lacking in robustness that they are not very useful for policy.
- One could draw the same conclusion comparing Gordon's (1997) wage-price and price-price NAIRUs.

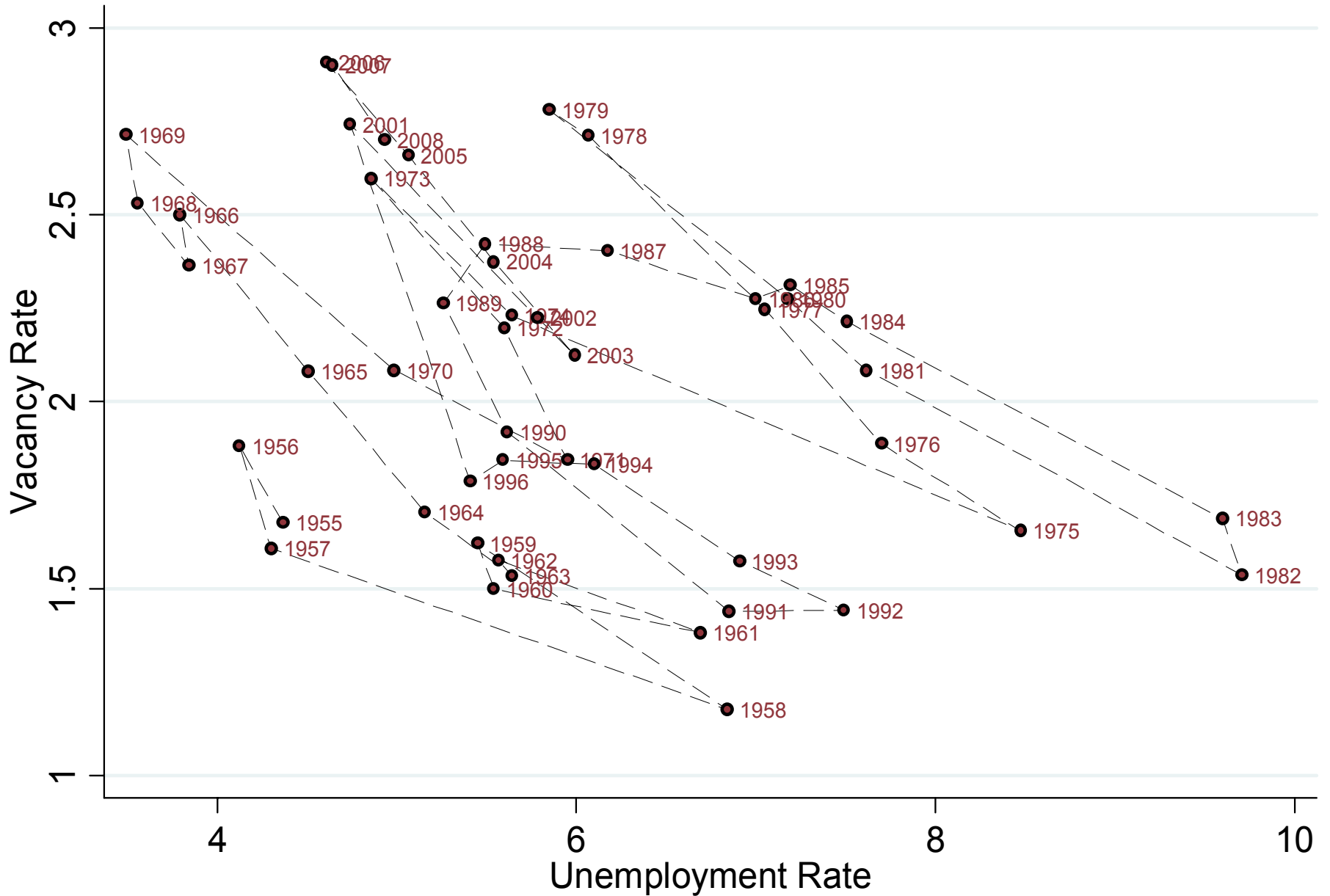
# Time to Look Elsewhere for Guidance

- There is too much going on in Phillips Curve to reliably estimate a time varying NAIRU
- Need to look elsewhere for information
- To the extent that varying NAIRU reflects changes in the efficiency of the labor market it is natural to look to indicators of labor market efficiency
- Obvious one is Vacancy-Unemployment relationship
- I'm going to argue that that relationship holds real promise for giving us much better information about the location of the NAIRU when we jointly estimate a Phillips and Beveridge curves.

# Can We Find Vacancies?

- US only recently started regularly collecting vacancy data.
- However, there is a long series on newspaper help-wanted advertising that can be matched at times with actual vacancy surveys.
- Zargorski (1998) looks fairly carefully at these data and concludes that except for a scale adjustment they track actual vacancies very closely up to 1994.
- Sometime between 1994 and 2001 when US starts collecting JOLTS data internet makes newspaper help-wanted ads obsolete. My sense is that it is reliable up till at least 1997, but useless by 1999.

# Beveridge Curve 1954-1996, 2001-2007



# Is There a Beveridge Curve?

- Picture seems to show high-frequency movement along a curve with the curve shifting at low frequency
- Much less chaotic than Phillips curve
- But to use it to help estimate the NAIRU we need a theory relating those movements to movements in the NAIRU.

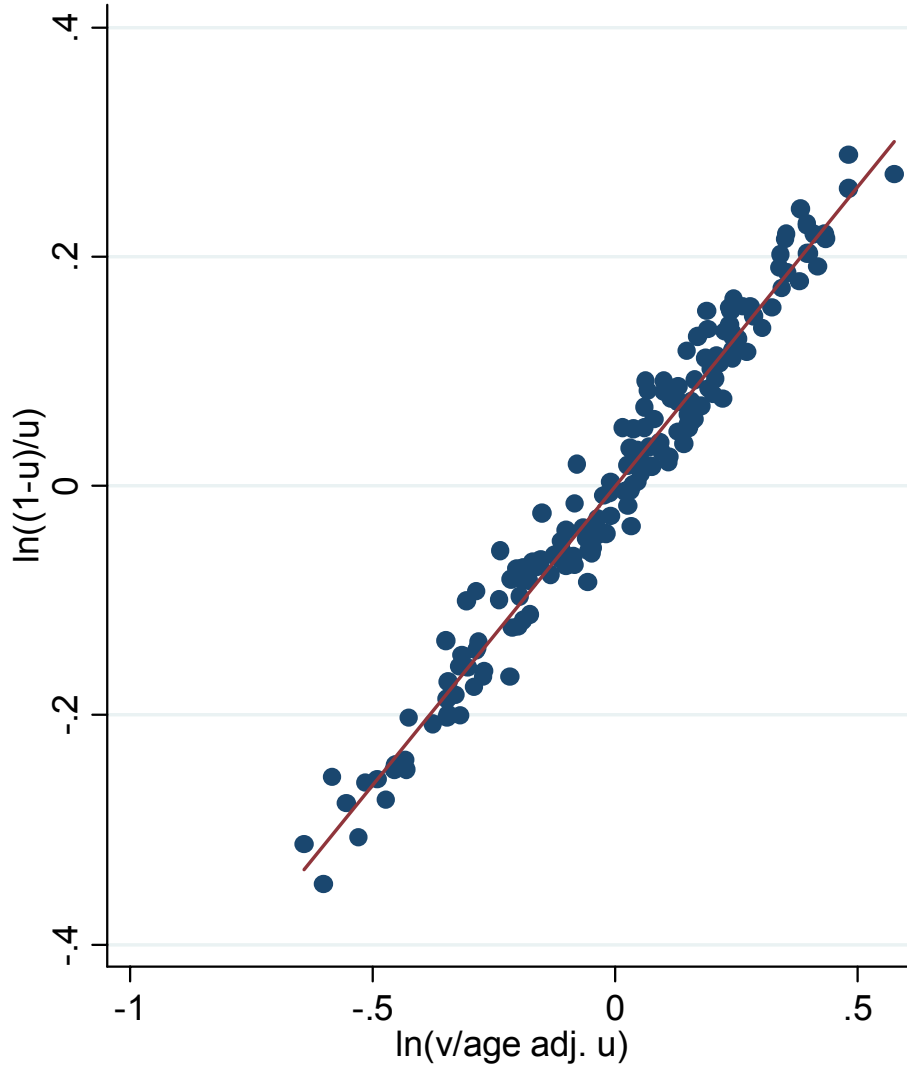
# Theory and Estimation

- Paper presents a continuous time matching model derived from Blanchard and Diamond (1989a and b).
- Use it to derive a specification for the Beveridge curve  $\ln([1-u]/u) = A(t) + b \ln(v/u)$ ;
  - $A(t)$  varies at low frequency so need way to filter it out to estimate  $b$
  - Use three different methods
    - Difference
    - Filter
    - Estimate only on stable time periods

# Two Examples of Model Fit

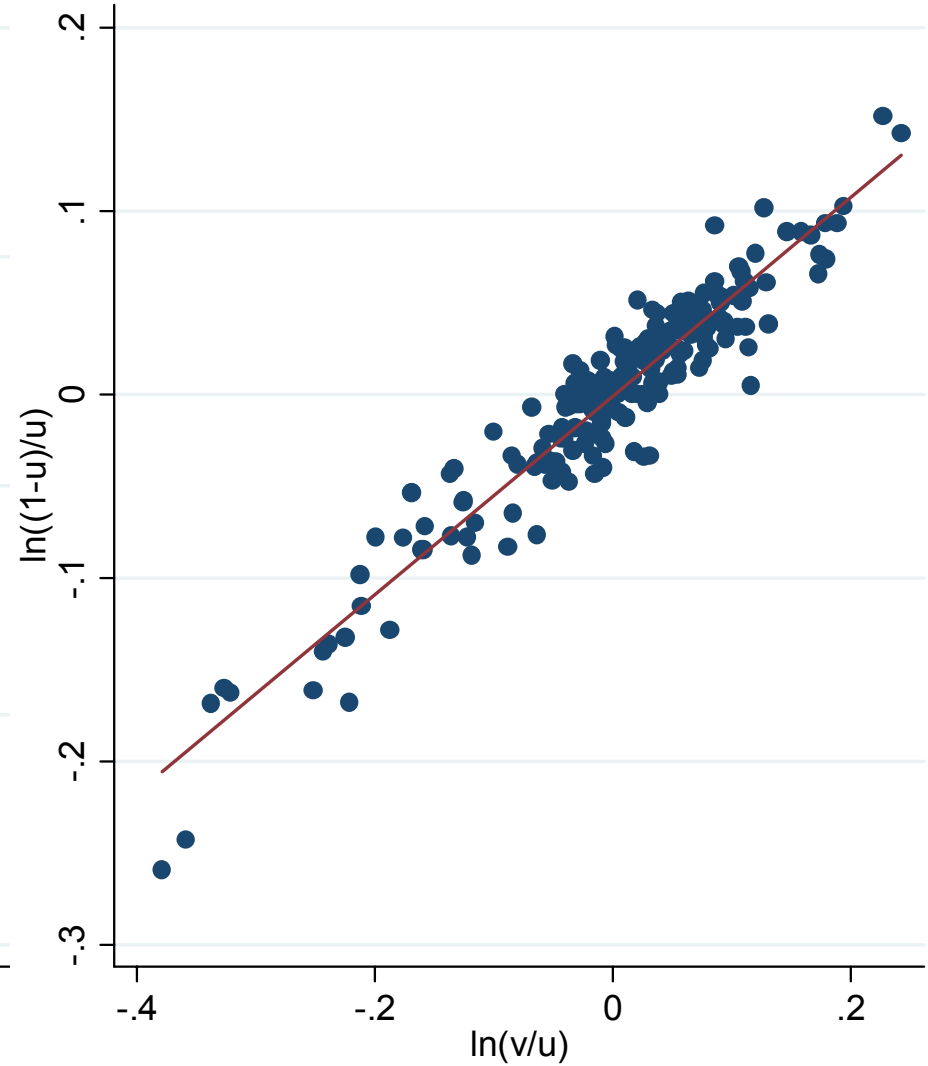
## Filtered Model 25Q MA

$Rsq = 0.97, b = 0.53$



## First Difference Model, no const

$Rsq = 0.902, b = 0.542$



The sample period used : 1954-1996, 2001-2007

Table 1: Alternative Estimates of The Vacancy-Unemployment Relationship

			First Difference		Filtered (two sided MA)			Stable Time Periods		
			With Const ant	No Const ant	9Q windo w	17Q windo w	25Q windo w	1958 Q3-1968 Q4	1975 Q2-1985 Q4	2001 Q1-2007 Q2
Age - adjus ted Unem ploym ent	OLS	b	0.52	0.52	0.51	0.52	0.52	0.51	0.54	0.57
		se	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	IV	b	0.46	0.46	0.46	0.50	0.50	0.50	0.53	0.57
		Se	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01
Unem ploym ent	OLS	b	0.50	0.50	0.49	0.52	0.52	0.53	0.55	0.55
		Se	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	IV	b	0.46	0.46	0.44	0.49	0.50	0.52	0.54	0.55
		Se	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01

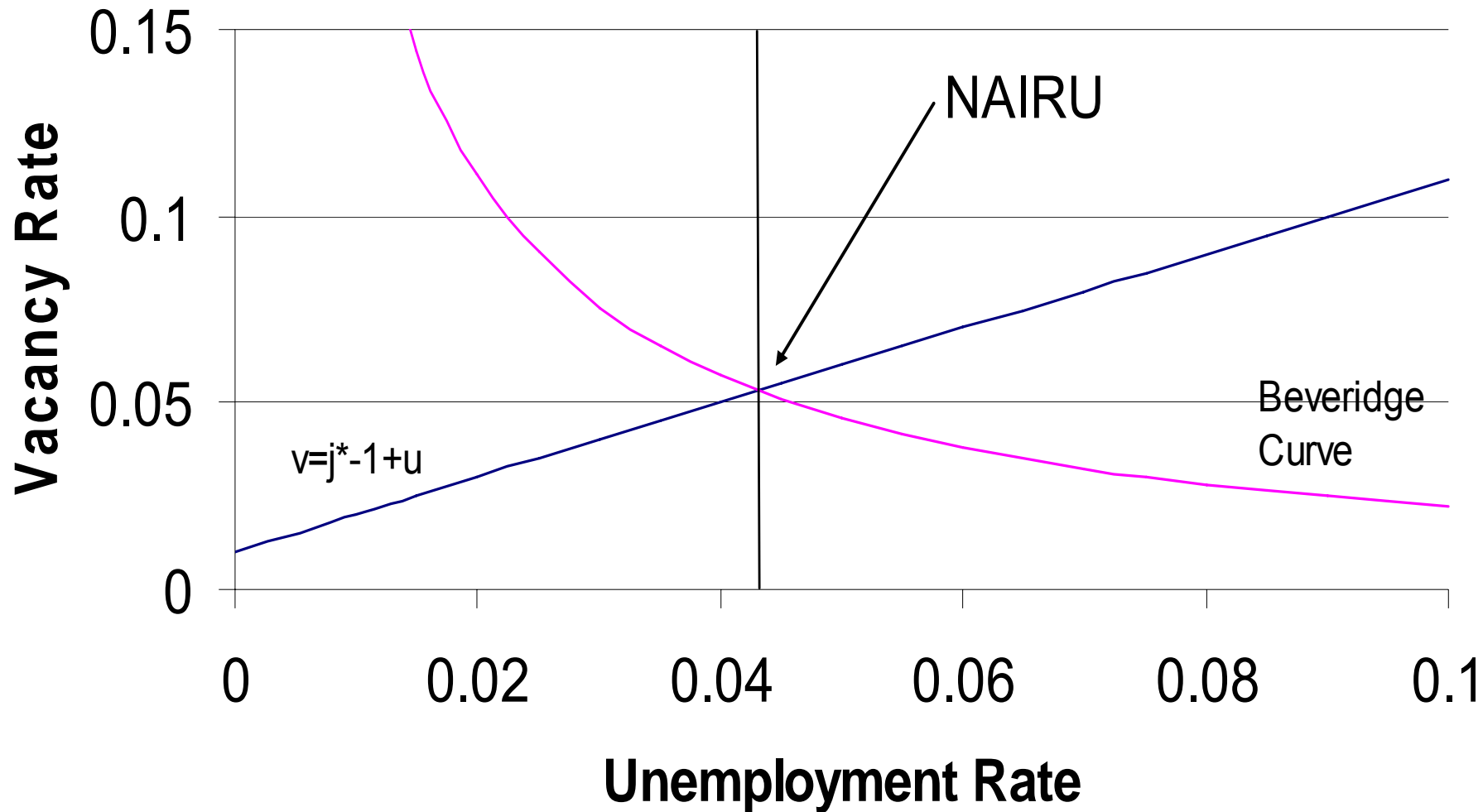
Note: The regressions using first differenced data use both the JOLTS and Help-Wanted Index; The regressions using filtered data use only the Help - Wanted Index data from 1955Q1-1996Q4; Stable Time Periods - 1958Q3-1968Q4 and 2001Q1-2007Q2 - Help - Wanted Index, 2001Q1-2007Q2 - JOLTS

The instrumental variables used are 4 lags of the unemployment rate

# How do We Identify NAIRU?

- Theory in paper divides movements in the NAIRU into two parts
  - Shifts in the efficiency of the matching process and the amount of churning affect the position of the Beveridge curve
  - The excess of jobs to workers in equilibrium determines where on the Beveridge Curve the NAIRU is

# Determination of NAIRU from Beveridge Curve



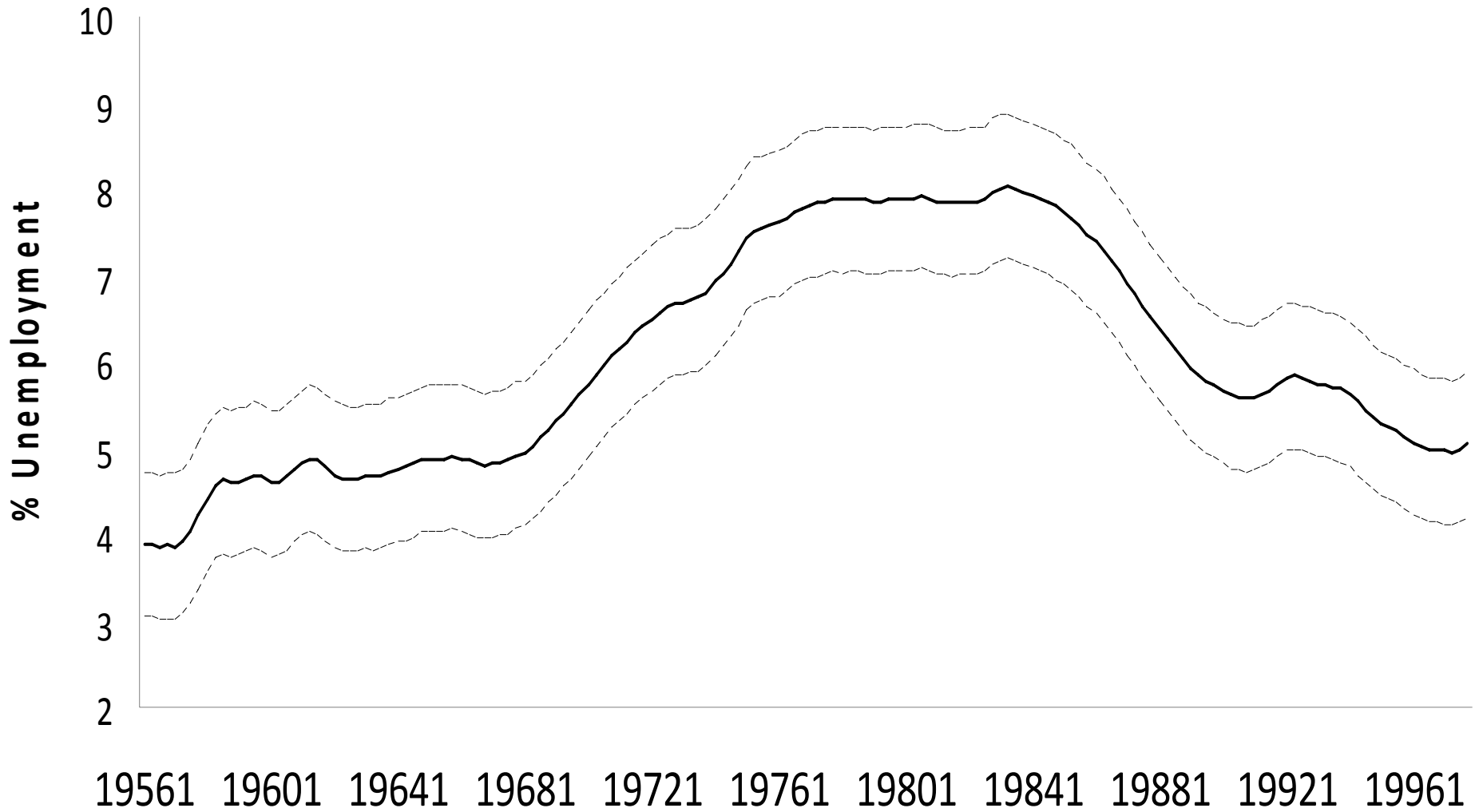
# How Do the Two Factors Move?

- Most stories one would tell about why the Beveridge curve would move would suggest that excess vacancies would shift as well
  - If increased unemployment compensation lowers search intensity it probably also increases the wage employers have to pay and thus reduce labor demand
  - If declining labor rents mean less wait unemployment for high wage jobs employers are also paying less for workers and can expand employment relative to the labor force

# Model Specification

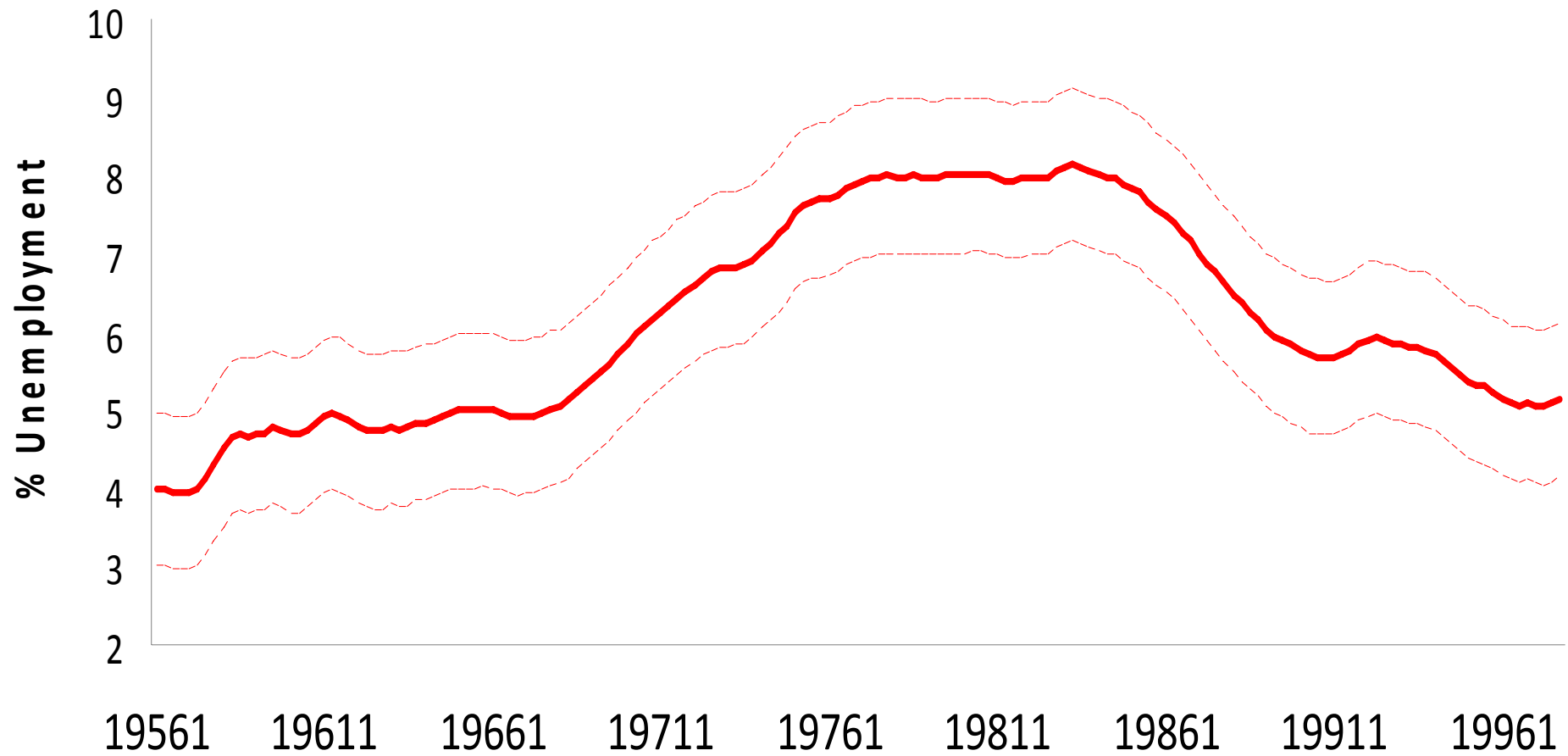
- In the empirical work I assume a simple deterministic relationship between the unobserved driver of the NAIRU and both the position of the Beveridge curve and equilibrium excess vacancies.
- I invert the relationship, linearize it and end up with the following equations to be estimated via Kalman filter with NAIRU the unobserved state variable.
- The two equations are
  - PC:  
$$\pi_t = \pi_t^e + a(\text{NAIRU}_t - U_t) + \text{Supply Shock Dummies} + e_t$$
  - BC:  
$$\ln([1-u]/u) = b + c \text{NAIRU}_t + d \ln(v_t/u_t) + z_t$$

# Beveridge Curve - Phillips Curve TV NAIRU



# Beveridge Curve - Wage-Price Phillips Curve TV

## NAIRU



		CPI Phillips Curve		CPI Phillips Curve		Wage-Price Phillips Curve		Wage-Price Phillips Curve	
		1956q1-1997q4		1956q1-2007q4		1958q1-1997q4		1956q1-2007q4	
Phillips Curve		Coef	SE	Coef	SE	Coef	SE	Coef	SE
	NAIRU-U	0.39	0.10	0.33	0.09	0.13	0.14	0.29	0.14
	Post 2001			-0.36	0.27			-1.68	0.44
Beveridge Curve									
	Constant	3.93	0.01	3.91	0.01	3.93	0.01	3.91	0.01
	NAIRU	-9.94	0.11	-9.91	0.10	-9.94	0.10	-9.91	0.10
	ln(v/u)	0.51	0.00	0.50	0.00	.50	0.00	0.50	0.00

All Equations have 4 lags of inflation and dummy variables for 1970s-1980s except 58-97 Wage-Price which has 12 lags supply shocks (same specification as ADP 2001)

# What Should You Believe About What I Just Showed You?

- Divide the Knowledge of the NAIRU into three parts
  - When the fluctuations are taking place
  - Magnitude of the fluctuations
  - Mean around which they are fluctuating
- Beveridge curve estimates gives you lots of information about the first
  - Movements in the BC easy to see
  - Question remains about how 45 degree line moves with BC
- If you believe in a vertical long-run Phillips curve you already know the 3<sup>rd</sup> (because the mean of the NAIRU series must equal the mean of actual inflation over long periods of time)
- That leaves the 2<sup>nd</sup> about which there is still quite a bit of uncertainty that I haven't sorted out.

# Beveridge Curve - Phillips Curve TV NAIURU

