

# *Ins and Outs of the Long-Run Unemployment Dynamics*

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# Ins and Outs of the Long-Run Unemployment Dynamics

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## Abstract

This paper studies the contribution of inflow and outflow rates to the unemployment dynamics in the long-run. I find that in the U.S., both inflow and outflow rates contribute significantly to variation in the long-run trend of the unemployment rate. Inflow and outflow rates account for roughly similar proportions of overall unemployment variability in the long-run.

*Keywords:* Unemployment dynamics; Job finding rate; Separation rate; Long-run unemployment

*JEL classification:* E24; J64

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# 1 Introduction

Unemployment dynamics is determined by inflow and outflow rates of unemployment. The variation in unemployment may arise as a result of variation in the rate at which workers enter the unemployment pool, variation in the rate at which unemployed workers leave the unemployment pool, or some combination of the two. This suggests that, in order to understand unemployment dynamics, it is important to study how much of unemployment fluctuations can be accounted for by variations in inflow and outflow rates of unemployment. In the recent literature, a number of studies decompose business cycle variations in the unemployment rate into contributions from changes in inflow and outflow rates (Elsby, Michaels and Solon, 2009; Fujita and Ramey, 2009; Petrongolo and Pissarides, 2008; Shimer, 2007). However, less attention has been placed on long-run unemployment dynamics. Studying long-run unemployment dynamics is of interest because the unemployment rate fluctuates considerably not only over the business cycles but also in the long-run. Furthermore, facts on long-run unemployment dynamics provide a guideline of the empirical features that models for analyzing unemployment in the long-run should have.<sup>1</sup>

The purpose of this paper is to study the contribution of inflow and outflow rates to the long-run unemployment dynamics. To do this, I isolate the long-run trend of the job-finding and separation rates by using filtering methods. I then compute the long-run trend in the unemployment rate by using trends in job finding and separation rates. The long-run trend in the unemployment rate is expressed as the ratio of the separation rate to the sum of job-finding and separation rates. By using the strong relationship between the constructed long-run trend in the unemployment rate and the low frequency component of the actual unemployment rate, I distinguish between the importance of fluctuations in job finding and separation rates for the overall unemployment variability in the long-run. This paper reveals that both inflow and outflow rates contribute significantly to variation in the long-run trend in the unemployment rate in the U.S. I find approximately a 50:50 split in influence between inflow and outflow rates to unemployment variation.

Several recent studies calculate the relative importance of inflow and outflow rates to the unemployment variability over the business-cycle in the U.S. Hall (2005) and Shimer (2007) claims that the outflow rate dominates and the inflow rate is acyclical. In contrast, Elsby, Michaels and Solon (2009) and Fujita and Ramey (2009) find a greater role for inflow rates that account for around half of cyclical changes in unemployment. This paper complements these studies by analyzing if the movements in the long-run component of the unemployment rate are due to changes in inflow and outflow rates.

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<sup>1</sup>Search and matching models provide a useful framework to analyze the dynamics of unemployment. Inflow and outflows of unemployment lie at the heart of models of equilibrium unemployment. See for example, Mortensen and Pissarides (1994) and Pissarides (2000).

## 2 Contribution to unemployment dynamics

This study quantifies the contributions of inflow and outflow rates to overall unemployment variability in the long-run. Following Shimer (2007) and Fujita and Ramey (2009), I approximate the unemployment rate using the theoretical steady-state value associated with the contemporaneous job finding and separation rates. Thus,

$$(1) \quad u_t \simeq u_t^* = \frac{s_t}{s_t + f_t},$$

where  $u_t$ ,  $f_t$ , and  $s_t$  are the long-run trends of the three series obtained by filtering methods, and  $u_t^*$  is the long-run trend in the unemployment rate. Note that the long-run trend in the unemployment rate is expressed as the ratio of the separation rate to the sum of job-finding and separation rates.

Let  $C_{s,t}^*$  denote the contribution of changes in the separation rate to changes in the long-run trend in the unemployment rate. Similarly, let  $C_{f,t}^*$  denote the contribution of changes in the job finding rate to changes in the long-run trend in the unemployment rate. By taking the first difference of (1), I obtain

$$\begin{aligned} \Delta u_t^* &= (1 - u_t^*) u_{t-1}^* \frac{\Delta s_t}{s_{t-1}} - u_t^* (1 - u_{t-1}^*) \frac{\Delta f_t}{f_{t-1}} \\ &= C_{s,t}^* + C_{f,t}^*, \end{aligned}$$

where  $\Delta x_t \equiv x_t - x_{t-1}$ . The first term on the right-hand side measures the contribution of changes in the trend of the separation rate  $s_t$  to changes in the long-run trend in the unemployment rate. Similarly, the second term is the contribution of changes in the trend of the job finding rate  $f_t$  to the variation in the long-run trend in the unemployment rate.

Following Fujita and Ramey (2009) and Petrongolo and Pissarides (2008), we quantify the contribution of inflow and outflow rates by calculating the “beta values” in finance. Thus, I calculate

$$\beta_i = \frac{\text{cov}(\Delta u^*, C_i^*)}{\text{var}(\Delta u^*)}, \quad i = f, s$$

as measures of the contributions of fluctuations in the relevant transition rate to overall fluctuations in the long-run trend in the unemployment rate.

## 3 Data and Results

The unemployment rate is the quarterly average of seasonally adjusted monthly data constructed by the Bureau of Labor Statistics (BLS) using the Current Population Survey (CPS) data. In this paper, I define the job finding rate as the rate of transition from unemployment to employment, and the separation rate as the rate of transition from employment and unemployment. Shimer (2007) and Elsby, Michaels and Solon (2009) use short-term unemployment data and total unemployment data to derive these rates. Following Shimer’s (2007)

time aggregation correction, I measure job finding and separation rates from the CPS over the 1949Q1-2007Q1 period.

In order to derive the trends of the unemployment rate, the job finding rate, and the separation rate, I use the band-pass filter (henceforth BP filter). The BP filter is a linear filter which retains the cyclical components of each series within a specific band of frequency and removes other components. By using the BP filter, I can isolate the long-term components of labor market series. Let  $y_t$  be a quarterly time series, and let  $y_t^*$  denote its trend. Following Staiger, Stock and Watson (2001),  $y_t^*$  is estimated by passing  $y_t$  through a two-side low-pass filter, with a cutoff frequency of 15 years.<sup>2</sup> Essentially, this estimates  $y_t^*$  as a long two-sided weighted moving average of  $y_t$  with that sum to one. Estimates of the trend at the beginning and end of the sample are obtained by extending the series with autoregressive forecasts and backcasts of  $y_t$ , constructed from an estimated AR(4) model for the first difference of  $y_t$ . For the purpose of comparison, I also use the Hodrick and Prescott (1997) filter (henceforth HP filter).<sup>3</sup>

Now I quantify the contributions of variations in trends of job finding and separation rates to overall long-run unemployment variability. Let  $\bar{f}$  and  $\bar{s}$  denote the average of the trend of job finding and separation rates during the sample period. Then, I compute the following hypothetical unemployment rates

$$u_t^f \equiv \frac{\bar{s}}{\bar{s} + f_t} \text{ and } u_t^s \equiv \frac{s_t}{s_t + \bar{f}}$$

as measures of the contributions of fluctuations in the job finding and separation rates to the overall fluctuations in the unemployment rate.

Figure 1 plots hypothetical unemployment rates  $u^*$ ,  $u^f$ , and  $u^s$  together with the trend of the actual unemployment rate. Figure 1 shows that hypothetical unemployment rate  $u^*$  tends to move with the trend of the actual unemployment rate. The correlation between these two series is 0.99. I use this strong relationship to distinguish between the importance of fluctuations in job finding and separation rates for the overall unemployment variability. Figure 1 shows that both hypothetical unemployment rates move with the long-run trend in the unemployment rate. This implies that both the job finding rate and the separation rate move with the unemployment in the long-run. The long-run trend in the unemployment rate  $u^*$  and the hypothetical unemployment  $u^f$  closely move together until the early 1970s. This implies that the job finding rate alone can account for much of the variation in the long-run unemployment in the period. From the early 1970s to the end of 1990s, both hypothetical unemployment rates  $u^f$  and  $u^s$  move together with the long-run trend in the unemployment rate. Thus, during this period, not only variation in the job finding rate but also variation in the separation rate contribute the long-run variation in the unemployment rate. This can be

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<sup>2</sup>When I adopt the definition of the business cycle as the cyclical components between 1.5 years and 8 years following Baxter and King (1999) and Stock and Watson (1999) and use these limits as the definition of business cycles so to isolate the trend or low frequency of the data, I get similar results.

<sup>3</sup>However, it is worth noting that using the HP filter is not suitable for the analysis of the long run components of an economic series. The HP filter is best interpreted as a high-pass filter isolating frequencies of 8 years and higher in economic data and is not intended for frequencies falling into other bands.

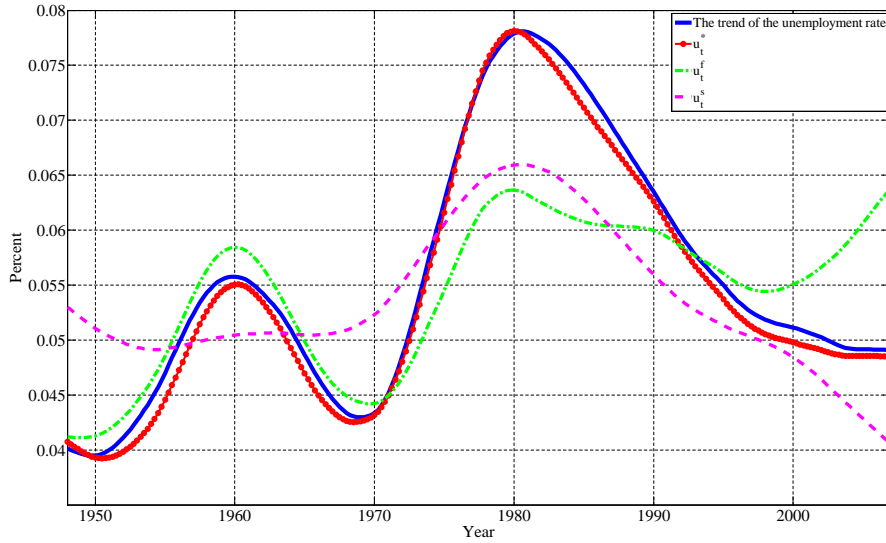


Figure 1: Contribution of unemployment rate variability (band-pass filtered data)

*Note:* The solid line indicates the filtered actual unemployment rate. The line with circle indicates hypothetical unemployment rate  $u^*$ . The dashed line indicates the hypothetical unemployment rate if there were only fluctuations in the job finding rate  $u^f$ . The dash-dotted line indicates the hypothetical unemployment rate with only fluctuations in the separation rate  $u^s$ . See text for definitions of  $u^*$ ,  $u^f$  and  $u^s$ . The unemployment rate is a quarterly average of the seasonally adjusted monthly series constructed by the BLS from the CPS. The trends of job finding and separation rates are obtained by applying the band-pass filter. Sample covers 1948Q1-2007Q1.

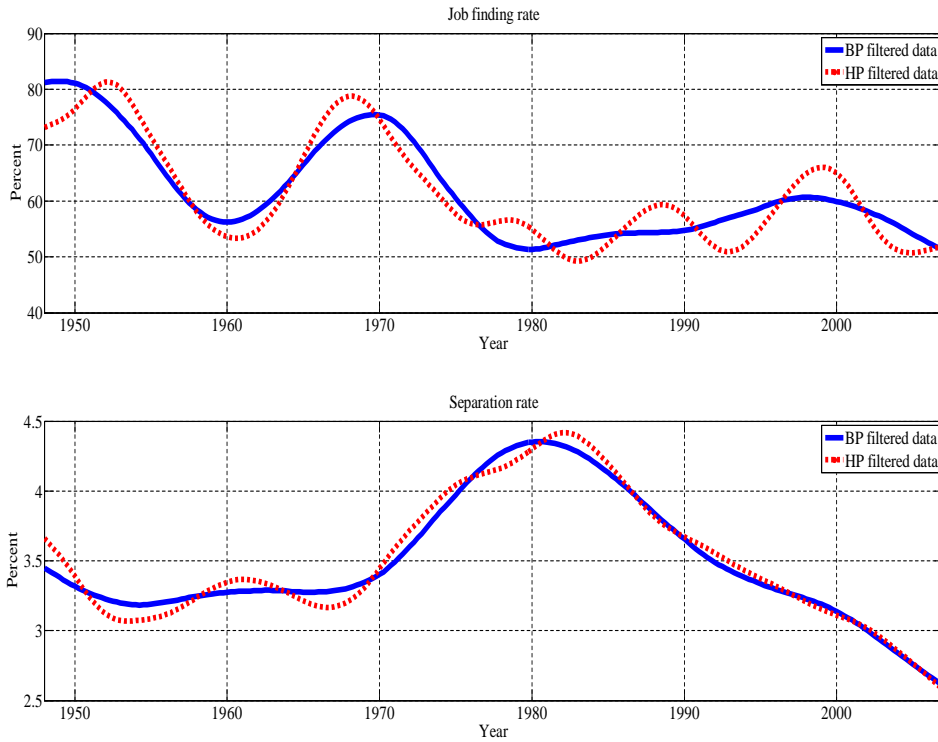


Figure 2: The trends of job finding and separation rates

*Note:* The job finding and the separation rates are constructed by Shimer (2007). See Shimer (2007) for data construction details. The solid line indicates the band-pass filtered data. The trends are estimated by passing raw time series data through a two-sided low pass filter, with a cutoff frequency corresponding to 15 years. The dashed line indicates the HP filtered data with the smoothing parameter  $\lambda = 1600$ . Sample covers 1948Q1-2007Q1.

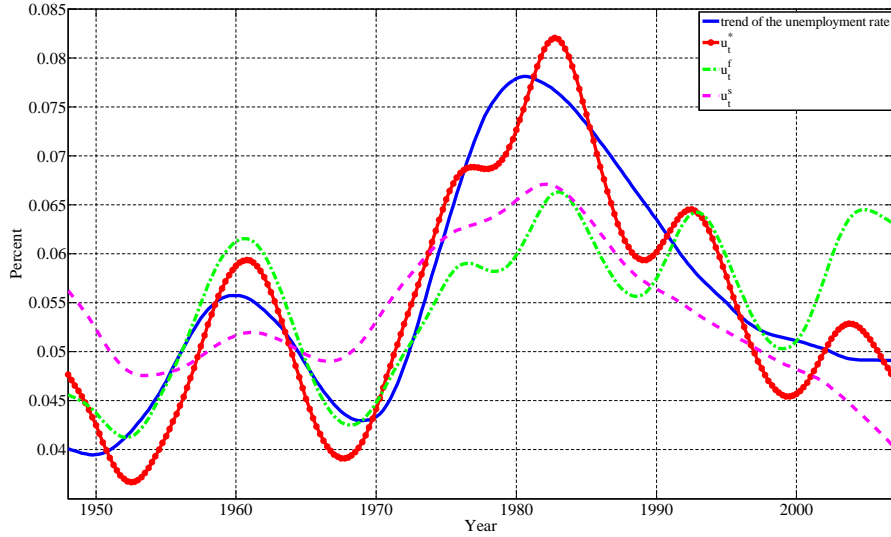


Figure 3: Contribution of unemployment rate variability (HP filtered data )

*Note:* The solid line indicates the filtered actual unemployment rate. The line with circle indicates hypothetical unemployment rate  $u^*$ . The dashed line indicates the hypothetical unemployment rate if there were only fluctuations in the job finding rate  $u^f$ . The dash-dotted line indicates the hypothetical unemployment rate with only fluctuations in the separation rate  $u^s$ . See text for definitions of  $u^*$ ,  $u^f$  and  $u^s$ . The unemployment rate is a quarterly average of the seasonally adjusted monthly series constructed by the BLS from the CPS. The trends of job finding and separation rates are obtained by applying the HP filter with the smoothing parameter  $\lambda = 1600$ . Sample covers 1948Q1-2007Q1.



understood by looking at the trends of job finding and separation rates. Figure 2 presents the long-run trends of job finding and separation rates. In 1950s and 1960s, while the trend in the job finding rate fluctuated, the trend in the separation rate was stable. In contrast, from the early 1970s to the end of 1990s, there were relatively large variations in the separation rate. These movements of job finding and separation rates generate the above mentioned results. In order to assess the robustness of these findings to the choice of a filtering method, I repeat the exercise, using the HP filtered data. The results are shown in Figure 3 and conform the preceding ones.

Table 1: Decomposition of long-run unemployment fluctuations

Filtering Method	$\beta_f$	$\beta_s$
BP	0.535	0.461
HP with the smoothing parameter $\lambda = 1600$	0.550	0.448
HP with the smoothing parameter $\lambda = 10^5$	0.441	0.557

To quantify the contribution of job finding and separation rates to overall unemployment variability, I compute the beta values. Table 1 reports the beta values calculated under the two filtering methods. It shows that both job finding and separation rates significantly affect variations in the unemployment in the long-run. In the BP filtered data and the HP filtered data ( $\lambda = 1600$ ), the job finding and separation rates account for around 55% and 45% of unemployment variability, respectively. In contrast, trend series generated through the HP filter with a higher smoothing parameter generates the opposite results. In the HP filtered data ( $\lambda = 10^5$ ), the separation rate has the dominant role in explaining unemployment fluctuations, accounting for 56% of it. Thus, both inflow and outflow rates contribute significantly to variation in the long-run trend in the unemployment rate. This result contrasts with the recent empirical evidence on the unemployment dynamics over the business cycle, in which the job finding rate is dominant determining the unemployment fluctuation.

## 4 Conclusion

This paper studies the contribution of inflow and outflow rates to the unemployment variability in the long-run. I compute the long-run trend in the unemployment rate by using trends in job finding and separation rates. Then, I distinguish between the importance of fluctuations in job finding and separation rates for the overall unemployment variability in the long-run. The trends of job finding and separation rates are obtained using filtering methods. This paper finds that in the U.S., both job finding and separation rates contribute significantly to variation in the long-run component of the unemployment rate. This result contrasts with the recent U.S. empirical evidence on the unemployment dynamics over the business cycle, in which the job finding rate is dominant determining the unemployment fluctuation.

## References

- [1] Baxter, M., King, R. G., 1999. Measuring Business Cycles: Approximate Band-pass Filters for Economic Time Series. *Review of Economics and Statistics* 81, 575–593.
- [2] Elsby, M., Michaels, R., Solon, G., 2009. The Ins and Outs of Cyclical Unemployment. *American Economic Journal: Macroeconomics* 1 (1), 84-110.
- [3] Fujita, S., Ramey, G., 2009. The Cyclicalities of Separation and Job Finding Rates. *International Economic Review* 50 (2), 415-430.
- [4] Hall, R. E., 2005. Employment efficiency and sticky wages: evidence from flows in the labor market. *Review of Economics and Statistics* 297 (3), 397-407.
- [5] Hodrick, R. J., Prescott, E. C., 1997. Postwar US Business Cycles: An Empirical Investigation. *Journal of Money, Credit, and Banking* 29, 1-16.
- [6] Mortensen, D. T., Pissarides, C. A., 1994. Job creation and job destruction in the theory of unemployment. *Review of Economic Studies* 61, 397-415.
- [7] Petrongolo, B., Pissarides, C. A., 2008. The Ins and Outs of European Unemployment. *American Economic Review* 98 (2), 256-262.
- [8] Pissarides, C. A., 2000. *Equilibrium Unemployment Theory*, second ed. MIT Press, Cambridge, MA.
- [9] Shimer, R., 2007. Reassessing the Ins and Outs of Unemployment. Manuscript. University of Chicago.
- [10] Staiger, D., Stock, J., Watson, M., 2001. Prices, Wages and the U.S. NAIRU in the 1990s. In Krueger, A. B, Solow, R. (Eds.), *The Roaring '90s: Can Full Employment Be Sustained*. Russell Sage and Century Fund, New York, 3–60.
- [11] Stock, J., Watson, M., 1999. Business Cycle Fluctuations in U.S. Macroeconomic Time Series. In: Woodford, M., Taylor, J. B. (Eds.), *Handbook of Macroeconomics*, vol. 1. Elsevier Science, Amsterdam, 3-64.