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REASSESSING THE SHIMER FACTS

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Reassessing the Shimer Facts*

Shigeru Fujita† and Garey Ramey‡

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Abstract

In a recent influential paper, Shimer (2005a) uses CPS duration and gross flow data to draw two conclusions: (1) separation rates are nearly acyclic; and (2) separation rates contribute little to the variability of unemployment. In this paper we assert that Shimer's analysis is problematic, for two reasons: (1) cyclicality is not evaluated systematically; and (2) the measured contributions to unemployment variability do not actually decompose total unemployment variability. We address these problems by applying a standard statistical measure of business cycle comovement, and constructing a precise decomposition of unemployment variability. Our results disconfirm Shimer's conclusions. More specifically, separation rates are highly countercyclical under various business cycle measures and filtering methods. We also find that fluctuations in separation rates make a substantial contribution to overall unemployment variability.

JEL codes: J63, J64

Keywords: Job loss, Hiring, CPS worker flows

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1 Introduction

Using unemployment duration and gross flow data from the CPS, Shimer (2005a) constructs new quarterly data series for aggregate separation and job finding hazard rates.[1] Based on these data, he draws strong conclusions concerning the cyclical behavior of the hazard rates, forcefully articulated in his abstract:

> The job finding probability is strongly procyclical and the separation probability is nearly acyclical, particularly during the last two decades.

Shimer also measures the contributions of fluctuations in the separation and job finding rates to the variability of unemployment. He sums up his evidence as follows:

> ...from 1948 to 1985, the separation rate tended to move with the unemployment, although it rarely explained more than half the fluctuation in unemployment. In the last two decades, however, the separation rate has varied little over the business cycle (p. 8).

These conclusions have proven to be highly influential in the literature. Blanchard and Gali (2006), Gertler and Trigari (2006), Haefke and Reiter (2006), Rudanko (2006), Rotemberg (2006), and others have appealed to these conclusions to justify the assumption of a constant separation rate in job matching models.

In this paper we assert that these conclusions are based on a methodology that is inappropriate for assessing the cyclical properties of separation and job finding rates. We focus on two specific problems with Shimer's analysis. First, cyclicality is not evaluated with reference to any rigorous measure of business cycle comovement. Second, his measures of contributions to unemployment variability do not actually decompose total unemployment variability.

We address the first problem by evaluating the cyclicality of separation and job finding rates using a standard statistical measure, the cross correlations of the hazard rates with given business cycle indicators. This exercise uncovers the interactions between the rates and underlying expansions and contractions of the economy. We consider three filtering

[1] Here we make use of Shimer's terminology in referring to movements from employment to unemployment as "separations." These might also be described as "job losses," as distinguished from "total separations" that incorporate movements from employment to employment.

methods (the Hodrick-Prescott filter with smoothing parameters of 1600 and of 10^5, and the Baxter-King filter with a cycle range of 6 quarters to 32 quarters) and two business cycle indicators (GDP and the unemployment rate).[2]

To carry out this analysis, we use data on separation and job finding hazard rates drawn from three separate sources. The first two are calculated in Shimer (2005a) using CPS duration and gross flow data. The third derives from quarterly averages of the monthly series constructed in Fujita and Ramey (2006), who also use the CPS gross flow data. Shimer's duration and gross flow data sets cover the sample periods 1951Q1-2004Q4 and 1967Q2-2004Q4, respectively, while the Fujita-Ramey data cover 1976Q1-2005Q4. All of the data series are corrected for time aggregation error, while the Fujita-Ramey series are also corrected for margin error.[3] We consider the full sample periods of the three data sets, as well as the post-1985 subsamples.

Our results disconfirm Shimer's first conclusion. In particular, separation rates are highly countercyclical. In the full samples of the three data sets, we find that separation rates exhibit a strong negative correlation with GDP. More precisely, the correlation of the separation rate with GDP at a lag of one quarter is never greater than -0.6 across all filtering methods and data sets. Notably, under the Baxter-King filter, the separation rate series obtained from Shimer's gross-flow-based series achieves a correlation of -0.84 with GDP at a lag of one quarter. Similarly, the correlation with unemployment at a lag of one quarter lies above 0.65 across all filtering methods and series, and the correlation exceeds 0.85 for Shimer's gross-flow-based series when the Baxter-King filter is used. These correlations weaken slightly over the post-1985 period, but the separation rate remains highly countercyclical. Thus, the evidence reveals that the separation rate is highly countercyclical, contrary to Shimer's conclusion.

In evaluating the contributions of separation and job finding hazard rates to unemployment variability, Shimer makes use of the fact that each period's actual unemployment rate is closely traced by the so-called stochastic steady state value that is defined as a function of the two hazard rates in each period. The contribution of separation rates is then evaluated in terms of counterfactual steady states that hold the job finding rate at

[2]The choice of 10^5 as a smoothing parameter is nonstandard in business cycle analysis, as it retains cycles of up to 22.7 years (see King and Rebelo (1993) for details). However, we consider this choice since it is used by Shimer.

[3]The latter series are the EU and UE hazard rates discussed in Section 5 of Fujita and Ramey (2006). Margin error refers to mismeasurement deriving from missing observations in the CPS sample.

its sample average. The contribution of job finding rates is similarly measured in terms of counterfactual steady states that hold the separation rate at its sample average. f Shimer observes that fluctuations in the contribution of separation rates, defined according to his measure, are small in comparison to fluctuations in the steady state unemployment measure, particularly in the post-1985 period. From this he concludes that separation rates make a small contribution to unemployment variability. On the other hand, his measure of the contribution of job finding rates exhibits fluctuations comparable to those of unemployment, supporting his idea that job finding rates make a large contribution to unemployment variability.

We argue that this analysis is problematic because Shimer's steady state approximation of the unemployment rate is nonlinear in the two hazard rates. Thus, the two terms in his analysis do not actually decompose unemployment variability. We address this problem by extending the idea put forth by Elsby et al. (2007) and developing contribution measures that express total unemployment variability as a sum of two factors, each of which is driven by fluctuations of the separation rate and the job finding rate, respectively.

The idea behind the method is simple. According to Shimer's steady state approximation of the unemployment rate, the economy begins each period in a stochastic steady state equal to the approximating steady state of the preceding period. Changes in current-period separation and job finding rates induce departures from this steady state, leading to changes in unemployment. Therefore, by linearizing the steady state equation around the hazard rates observed in the preceding period, we can express unemployment variations as a sum of two terms, each of which depends on the changes in separation and job finding rates from the previous period.

Based on our measures, we find that the contribution of separation rates exhibits high volatility across all three data sets and both sample periods. Specifically, the standard deviation of the contribution of separation rates amounts to between 64 and 106 percent of the standard deviation of unemployment.[4] Thus, fluctuations in the contribution of separation rates are not small in comparison to fluctuations in unemployment, contrary to Shimer's claim.

Further, our decomposition allows us to calculate the proportion of unemployment volatility that is explained by each of the hazard rates. We find that on average, separation rates explain between one-third and one-half of total unemployment variability in both

[4]Note that the variance of each term can exceed the total variance of unemployment fluctuations due to the presence of the covariance term.

the full samples and the 1985 subsamples. We conclude that separation rates make a quantitatively significant contribution to overall unemployment variability.

These findings have important implications for theoretical investigations of unemployment cyclicality. As indicated above, many recent papers have assumed constant separation rates on the basis of Shimer's conclusions. Another strand of recent research has sought to account for the volatility of unemployment using various specifications of the job matching model with constant separation rates.[5]

It is important to recognize, however, that models with constant separation rates cannot match the strong countercyclicality of observed separation rates identified here and in Fujita and Ramey (2006). Abstracting from cyclical movements in separation rates may introduce significant biases in results obtained from this class models. It is therefore necessary to assess whether these results are robust to allowing for realistic countercyclical variation in separation rates.

A growing number of researchers questions the validity of Shimer's assertions concerning the cyclicality of separation rates. Davis (2005) demonstrates the logical inconsistency between the hypothesis of acyclic separation rates and well-known facts about the cyclical adjustment of total hiring. Elsby et al. (2007) utilize a log-linear decomposition to show that NBER recessions are associated with steep increases in the separation rate, particulary among job losers. Nissim (2005) argues that the job matching model must incorporate endogenous separation rates in order to match key business cycle facts. Yashiv (2006) draws on several existing data sources to reach consonant conclusions concerning the cyclical comovement of separation rates. The contribution of the current paper is to focus on specific problems in Shimer's analysis, and on how these problems affect his conclusions.

The paper proceeds as follows. Section 2 lays out Shimer's analytic framework, Section 3 evaluates the cyclical comovement of separation rates, Section 4 considers the decomposition of unemployment variability, and Section 5 concludes.

[5] The basic constant-separation-rate model is described in chapter 1 of Pissarides (2000). Implications for unemployment variability have been considered by Hall (2005), Hagedorn and Manovskii (2006), Mortensen and Nagypál (2005), Shimer (2005b) and others.

2 Shimer's Analysis

Shimer's analysis considers two sets of continuous time hazard rate series, which he derives from CPS duration and gross flow data. Based on plots of these series, he concludes that separation rates are nearly acyclical and job finding rates are strongly procyclical.

He next considers the extent to which separation and job finding rates contribute to overall variations in unemployment. Let the separation and job finding rates be denoted by s_t and f_t, respectively. The magnitudes of the measured hazard rates suggest the following approximation of the unemployment rate:

$$u_t \simeq \frac{s_t}{s_t + f_t} \equiv u_t^{ss}, \tag{1}$$

where u_t denotes the unemployment rate in quarter t. Shimer argues that the actual unemployment rate u_t is closely approximated by u_t^{ss}, which is often called the stochastic steady state value.[6] He goes on to define the contribution of variations in the separation rate to variations in the unemployment rate as follows:

$$c_t^{sr} \equiv \frac{s_t}{s_t + \overline{f}},$$

where $\overline{f}$ gives the sample average of the job finding rate. Similarly, the contribution of variations in the job finding rate is defined by:

$$c_t^{jfr} \equiv \frac{\overline{s}}{\overline{s} + f_t},$$

where $\overline{s}$ gives the sample average of the separation rate.

Shimer plots the contribution variables c_t^{sr} and c_t^{jfr} in relation to u_t. Since the observed fluctuations in c_t^{sr} are small, he concludes that separation rates make a small contribution to variations in unemployment. The observed fluctuations of c_t^{jfr} are comparable to those of unemployment, however, from which he concludes that job finding rates make a large contribution. He further supports these conclusions by considering the contemporaneous correlations between the contribution variables and u_t.

While this analysis poses intriguing questions, there are two reasons why the methodology is inappropriate for analyzing the cyclical behavior of separation and job finding rates:

[6] Shimer (2005a) shows that the correlation coefficient between the actual unemployment rate and the stochastic steady state values amounts to 0.99.

1. There is no systematic evaluation of how the hazard rates s_t and f_t comove with any business cycle indicator, so concepts such as "acyclicality" and "procyclicality" of the rates do not have clear meanings.

2. The contribution variables fail to decompose overall unemployment variability. Since it is generally true that $u_t^{ss} \neq c_t^{sr} + c_t^{jfr}$, there will be variations in u_t^{ss} that cannot be explained by variations in c_t^{sr} and c_t^{jfr}.

We show below that once these problems are addressed, separation rates turn out to be strongly countercyclical, and they make a quantitatively significant contribution to the variability of unemployment.

3 Business Cycle Comovement

We begin by assessing the business cycle comovement of the separation and job finding rates s_t and f_t. Business cycle comovement is measured in terms of correlations with business cycle indicators at various leads and lags. This allows us to conduct a rigorous evaluation of the cyclicality of separation and job finding rates, thus addressing the first of the problems listed above.

We consider both GDP and the unemployment rate as cyclical indicators. To isolate business cycle frequencies, we apply the HP filter with smoothing parameters 1600 and 10^5, and also the band pass filter of Baxter and King (1999) with a band of 6 through 32 quarters. The latter filter is particularly salient in this instance, since the series exhibit considerable high-frequency variability that is retained by the HP filter.

Figure 1 depicts the cross correlations between the cyclical components of GDP and separation rates for the various data sets, sample periods and filtering methods. In the full samples, separation rates exhibit strong countercyclicality, with peak correlations at a lag of one quarter. This means that increases in the separation rate precede decreases in GDP by one quarter on average. Notably, under the Baxter-King filter, the correlation between GDP and the separation rate lagged one quarter stands at roughly -0.8 in all three data sets. The magnitudes fall somewhat in the post-1985 period, but they remain strongly negative.

The findings are similar when the unemployment rate is used as the cyclical indicator. As seen in Figure 2, separation rates continue to display strong countercyclicality, leading the unemployment rate by one or more quarters. Thus, by every measure, separation rates are highly countercyclical, contrary to Shimer's assertion of near acyclicality.

For completeness, we repeat this exercise for job finding rates. The results are reported in Figures 3 and 4. Consistent with Shimer's claim, we find that job finding rates are strongly procyclical, as shown by the large magnitudes of the correlations with GDP and unemployment. Note further that job finding rates tend to trail the business cycle. In Figure 3, peak correlations with GDP occur at leads of one or two quarters, meaning that the job finding rate lags GDP. The results do not change appreciably in the post-1985 subsamples. Correlations with unemployment, shown in Figure 4, are greatest at zero or one quarter leads in the duration- and gross-flow-based series, respectively, in both the full and post-1985 subsamples.[7]

4 Contributions to Unemployment Variability

Measurement. Under the steady state approximation (1), unemployment variability is captured by changes in the stochastic steady states u_t^{ss}. However, fluctuations in the contribution variables c_t^{sr} and c_t^{jfr} do not actually decompose the fluctuations in u_t^{ss}, since $u_t^{ss} \neq c_t^{sr} + c_t^{jfr}$ holds generally. We address this problem by exploiting the steady state approximation to develop quantitative measures of contributions to unemployment variability, building on the idea put forth by Elsby et al. (2007).

According to (1), changes in unemployment are proxied by $u_t^{ss} - u_{t-1}^{ss}$. The latter changes are equivalent to departures from the stochastic steady state u_{t-1}^{ss}. In other words, if $s_t = s_{t-1}$ and and $f_t = f_{t-1}$, then u_t^{ss} remains at the steady state value u_{t-1}^{ss}. Fluctuations in u_t^{ss} can then be linked to those of s_t and f_t by linearizing (1) around the steady state u_{t-1}^{ss}:

$$\frac{u_t^{ss} - u_{t-1}^{ss}}{u_{t-1}^{ss}} = (1 - u_{t-1}^{ss})\frac{s_t - s_{t-1}}{s_{t-1}} - (1 - u_{t-1}^{ss})\frac{f_t - f_{t-1}}{f_{t-1}}. \tag{2}$$

We adopt the following simplified notation:

$$du_t^{ss} \equiv \frac{u_t^{ss} - u_{t-1}^{ss}}{u_{t-1}^{ss}}, \quad du_t^{sr} \equiv (1 - u_{t-1}^{ss})\frac{s_t - s_{t-1}}{s_{t-1}}, \quad du_t^{jfr} \equiv -(1 - u_{t-1}^{ss})\frac{f_t - f_{t-1}}{f_{t-1}}.$$

Then (2) can be expressed compactly as follows.

$$du_t^{ss} = du_t^{sr} + du_t^{jfr}. \tag{3}$$

[7]Fujita and Ramey (2006) discuss the importance of lead-lag relationships for understanding how cyclical unemployment behavior is driven by job loss versus hiring.

Note that (3) represents the total variability of du_t^{ss} as a sum of factors that capture the separate contributions of s_t and f_t; this addresses the second problem of Shimer's analysis.[8]

Variability comparisons. Figure 5 graphs the values of du_t^{ss}, du_t^{sr} and du_t^{jfr} obtained using Shimer's duration-based hazard rate series, while Figure 6 depicts the values obtained from his quarterly gross-flow-based series.[9] The values calculated from quarterly averages of the Fujita-Ramey data are shown in Figure 7. Comparing the upper and lower panels of each figure, it is evident that the du_t^{sr} and du_t^{jfr} series exhibit variability similar to that of du_t^{ss}. This remains true in the post-1985 period. By this metric, both hazard rate series contribute substantially to variations in the unemployment rate. This is at odds with Shimer's conclusion, which is based on the problematic variables c_t^{sr} and c_t^{jfr}.

Table 1 quantifies the volatilities of du_t^{ss}, du_t^{sr} and du_t^{jfr} in terms of standard deviations. For the full samples of the three data sets, the standard deviations of du_t^{sr} range from 64 to 78 percent of the standard deviations of du_t^{ss}, while those of du_t^{jfr} range from 71 to 75 percent. The three data sources thus establish that the contributions of separation and job finding rates are roughly comparable in their variability.

For the post-1985 subsample, the standard deviations of du_t^{sr} amount to between 78 and 106 percent of the standard deviations of du_t^{ss} across the three data sets. The comparable range for du_t^{jfr} is 83 to 122 percent. Thus, in recent decades both contribution variables have become more volatile relative to unemployment. The contribution of separation rates, in particular, has remained highly volatile.

Important differences arise in comparing duration-based versus gross-flow-based series. The standard deviation of du_t^{sr} calculated using Shimer's duration-based series amounts to about 85 percent of the standard deviation of du_t^{jfr}, while in the two gross-flow-based series the standard deviations are roughly comparable.

[8]Here we make use of the steady state approximation to decompose unemployment variability into two factors. In is also possible to decompose the variability of the actual unemployment rate u_t in a similar fashion; a third factor appears in this case, representing variation in the approximation error. In evaluating this case, we find that the third factor has very small variability, and does not affect our conclusions about the relative explanatory power of the two hazard rates.

[9]Shimer applies the HP filter with smoothing parameter 10^5 in his analysis of c_t^{sr} and c_t^{jfr}. In the present setting, the variables are expressed in terms of growth rates, making further filtering inappropriate.

Variance decomposition. Equation (3) makes possible an exact decomposition of unemployment variability into factors that reflect the separate contributions of separation and job finding rates. Note that the variance of du_t^{ss} may be written:

$$Var(du_t^{ss}) = Var(du_t^{sr}) + Var(du_t^{jfr}) + 2Cov(du_t^{sr}, du_t^{jfr}) \tag{4}$$

$$= Cov(du_t^{ss}, du_t^{sr}) + Cov(du_t^{ss}, du_t^{jfr}).$$

The term $Cov(du_t^{ss}, du_t^{sr})$ gives the amount of variation in du_t^{ss} that derives from variation in du_t^{sr}, both directly and through its correlation with du_t^{jfr}. This may be expressed as a proportion of total variation:

$$\beta_t^{sr} = \frac{Cov(du_t^{ss}, du_t^{sr})}{Var(du_t^{ss})}.$$

Observe that β_t^{sr} is formally equivalent to the concept of beta in finance. Correspondingly, the proportion of variation in du_t^{ss} that derives from du_t^{jfr} is given by

$$\beta_t^{jfr} = \frac{Cov(du_t^{ss}, du_t^{jfr})}{Var(du_t^{ss})}.$$

From (4) we have $1 = \beta_t^{sr} + \beta_t^{jfr}$. Thus, the two betas serve to decompose the total variation in du_t^{ss} into the separate portions that derive from fluctuations in separation and job finding rates.

Table 2 reports the values of β_t^{sr} calculated from the various data sets and sample periods. For the full samples, separation rates contribute between 38 and 55 percent of total unemployment variability. The contribution of separation rates declines only moderately in the post-1985 subsample. These findings argue against Shimer's conclusion that variations in separation rates contribute little to unemployment variability.

Relation to Elsby et al. (2007). Elsby et al. (2007) log-differentiate u_t^{ss} to write the variation of unemployment as

$$d \ln u_t \simeq (1 - u_t)[d \ln s_t - d \ln f_t]. \tag{5}$$

This expresses unemployment variability as a sum of the terms $(1 - u_t) d \ln s_t$ and $-(1 - u_t) d \ln f_t$. Since u_t depends on both s_t and f_t, however, this does not decompose unemployment variability into components that reflect the contributions of each hazard rate. They proceed to make the approximation $1 - u_t \simeq 1$ in order to transform (5) into a linear decomposition. In this case, $d \ln u_t$ is expressed as a sum of factors $d \ln s_t$ and $-d \ln f_t$, which are simply log differences. Subject to the approximation, Elsby et al. interpret these log differences as contributions to unemployment variability. On the other hand, we construct our expression (3) to achieve a linear decomposition without imposing the approximation. This allows us to analyze variability in a rigorous fashion. In particular, building on (3), we are able to measure contributions to unemployment variability by means of a variance decomposition.

5 Conclusion

We have reevaluated Shimer's conclusions that (1) separation rates are essentially acyclic; and (2) they explain little of the variability of unemployment, based on addressing problems in his methodology. By rigorously assessing comovement with business cycle indicators, as well as developing a precise decomposition of unemployment variability, we have obtained results that disconfirm Shimer's conclusions. More specifically, we find the following:

1. Separation rates are strongly countercyclical and lead the business cycle by one or more quarters.

2. Separation rates make substantial contributions to the variability of the unemployment rate.

3. These conclusions remain valid in the post-1985 period.

Our results establish that job matching models with constant separation rates are inconsistent with the empirical evidence. When these models are evaluated in terms of other evidence, such as the volatility of unemployment, a discrepancy must exist with the facts about separation rates. Thus, the robustness of conclusions drawn from these models to cyclical variation in separation rates must be considered.

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Table 1: Contributions to unemployment fluctuations: standard deviations

	du_t^{ss}	du_t^{sr}	du_t^{jfr}
Full Samples			
Duration; Shimer (2005a)	0.087	0.056	0.065
Gross flow; Shimer (2005a)	0.092	0.072	0.065
Gross flow; Fujita and Ramey (2006)	0.064	0.049	0.048
Post 1985			
Duration; Shimer (2005a)	0.046	0.049	0.056
Gross flow; Shimer (2005a)	0.069	0.054	0.061
Gross flow; Fujita and Ramey (2006)	0.059	0.047	0.049

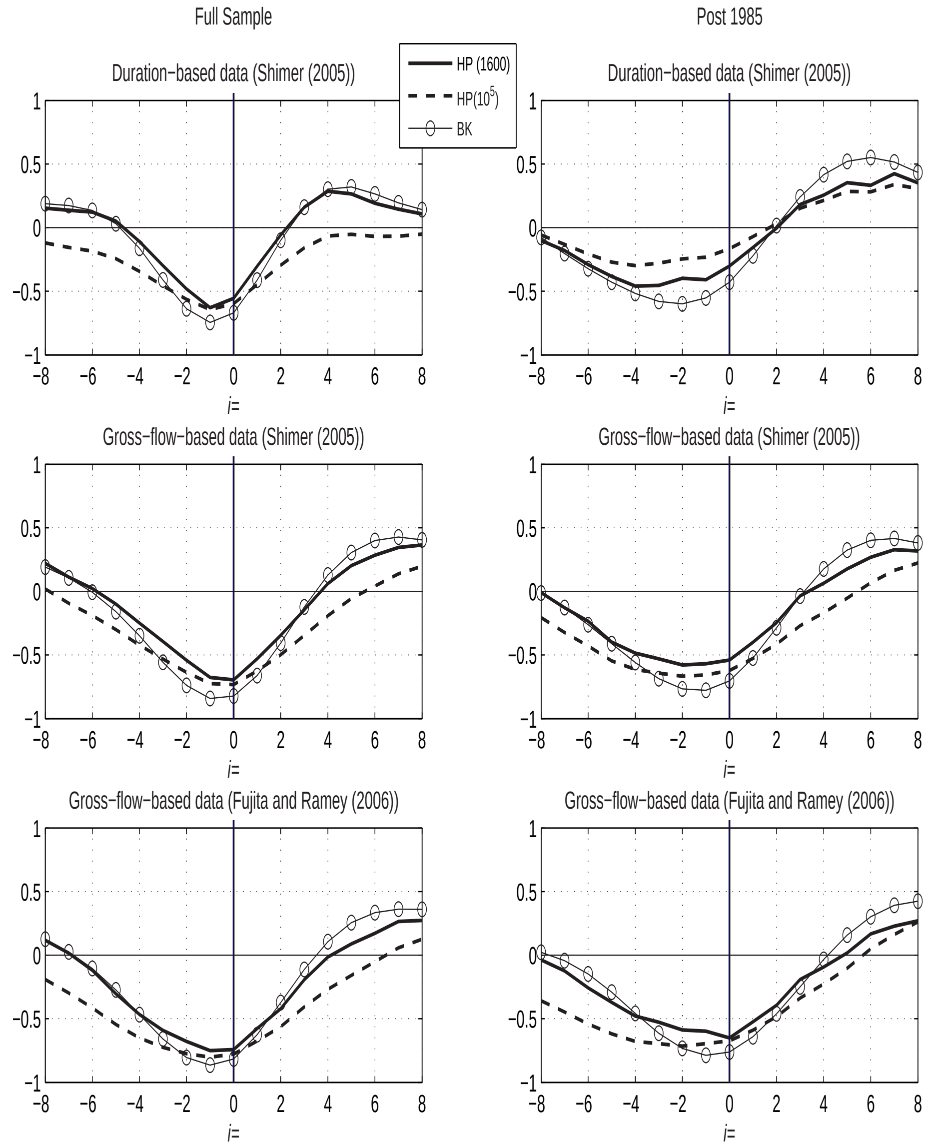
Notes: Full samples cover 1951Q1-2004Q4 for duration-based data, 1967Q2-2004Q4 for Shimer (2005a) gross-flow-based data, and 1976Q1-2005Q4 for Fujita and Ramey (2006) gross-flow-based data. Post 1985 samples cover 1986Q1-2004Q4 for duration-based data, 1986Q2-2004Q4 for Shimer (2005a) gross-flow-based data, and 1986Q1-2005Q4 for Fujita and Ramey (2006) gross-flow-based data. See text for the definitions of du_t^{ss}, du_t^{sr}, and du_t^{jfr}.

Table 2: Contributions to unemployment fluctuations: betas

	β_t^{sr}
Full Samples	
Duration; Shimer (2005a)	0.380
Gross flow; Shimer (2005a)	0.548
Gross flow; Fujita and Ramey (2006)	0.513
Post 1985	
Duration; Shimer (2005a)	0.320
Gross flow; Shimer (2005a)	0.407
Gross flow; Fujita and Ramey (2006)	0.478

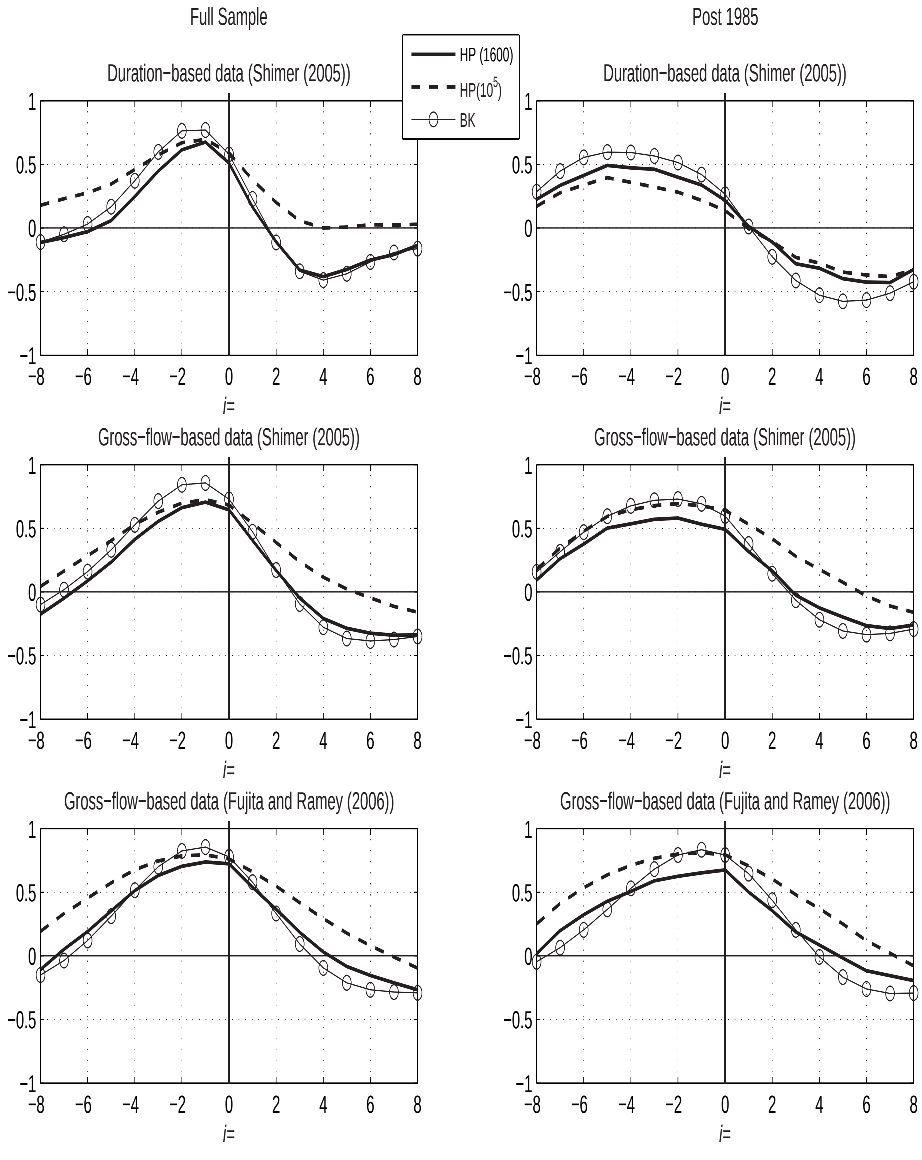
Notes: See Table 1 for sample periods of each data set. See text for the definition of β_t^{sr}.

Figure 1: Cross correlation between the cyclical components of GDP at t and the separation rate at $t + i$



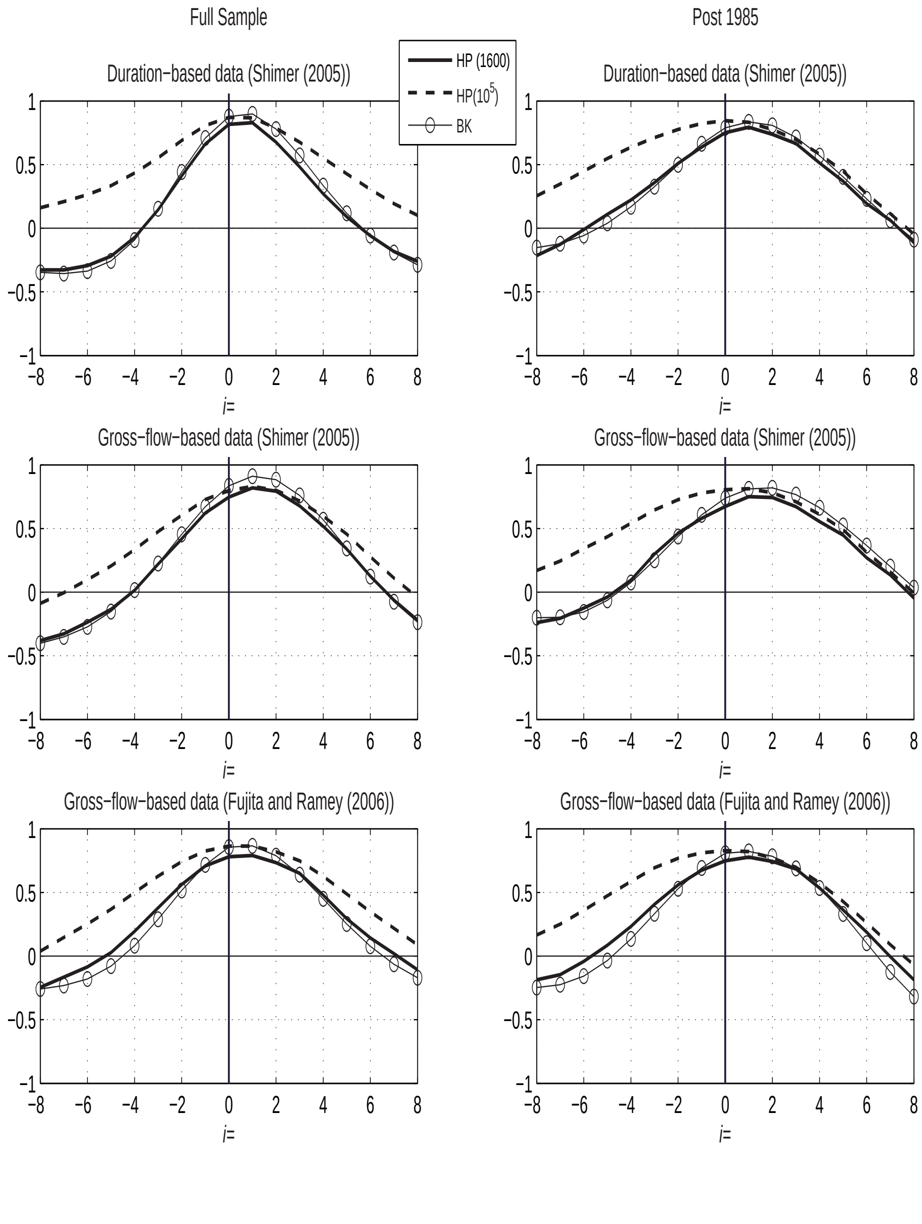
Notes: Full samples cover 1951Q1-2004Q4 for Shimer (2005a) duration-based data, 1967Q2-2004Q4 for Shimer (2005a) gross-flow-based data, and 1976Q1-2005Q4 for Fujita and Ramey (2006) gross-flow-based data. Post-1985 samples cover 1986Q1-2004Q4 for Shimer (2005a) duration-based data, 1986Q2-2004Q4 for Shimer (2005a) gross-flow-based data, and 1986Q1-2005Q4 for Shimer (2005a) gross-flow-based data. HP(1600): HP filter with the smoothing parameter of 1600. HP(10^5): HP filter with the smoothing parameter of 10^5. BK: Baxter and King's band-pass filter with the cycle range of 6 quarters through 32 quarters and with the bandwidth length of 12 quarters.

Figure 2: Cross correlation between the cyclical components of the unemployment rate at t and the separation rate at s$t + i$



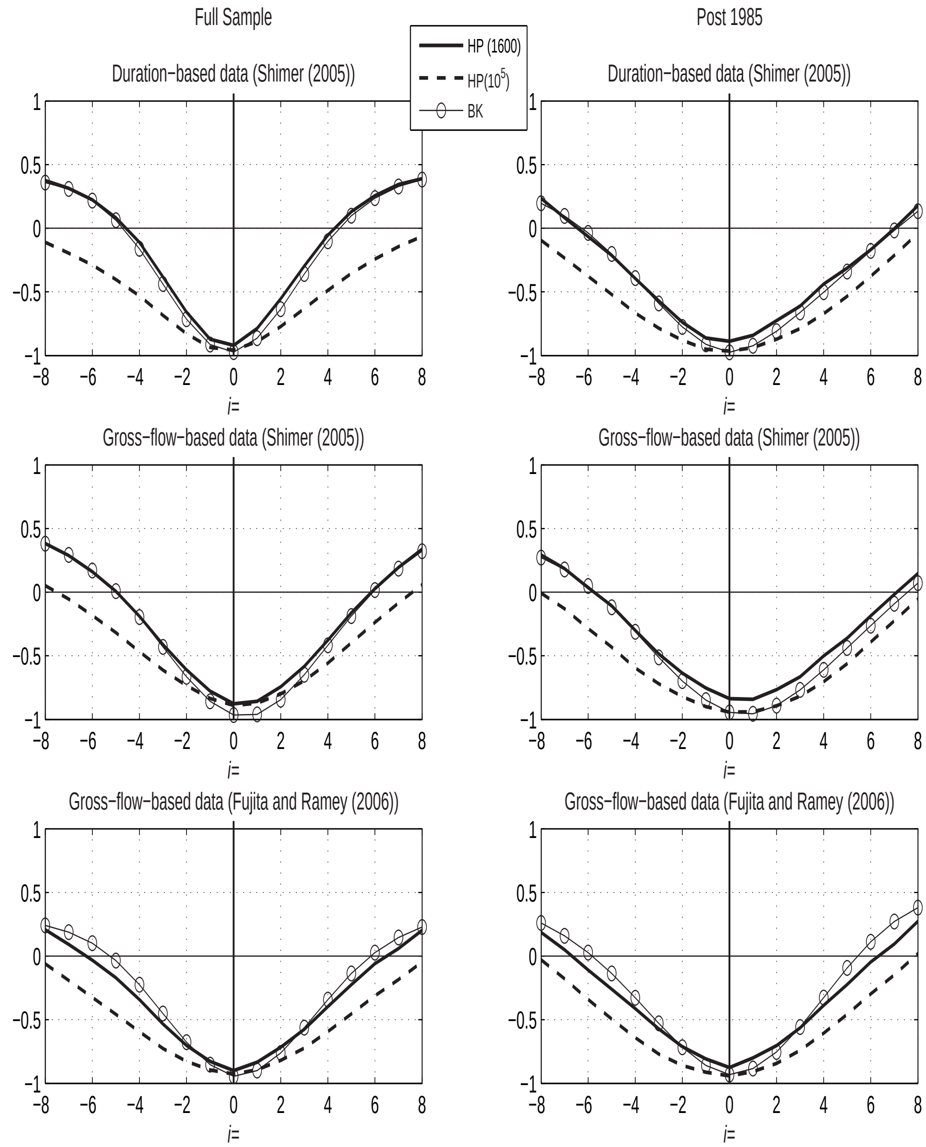
Notes: See notes for Figure 1.

Figure 3: Cross correlation between the cyclical components of GDP at t and the job finding rate at $t+i$



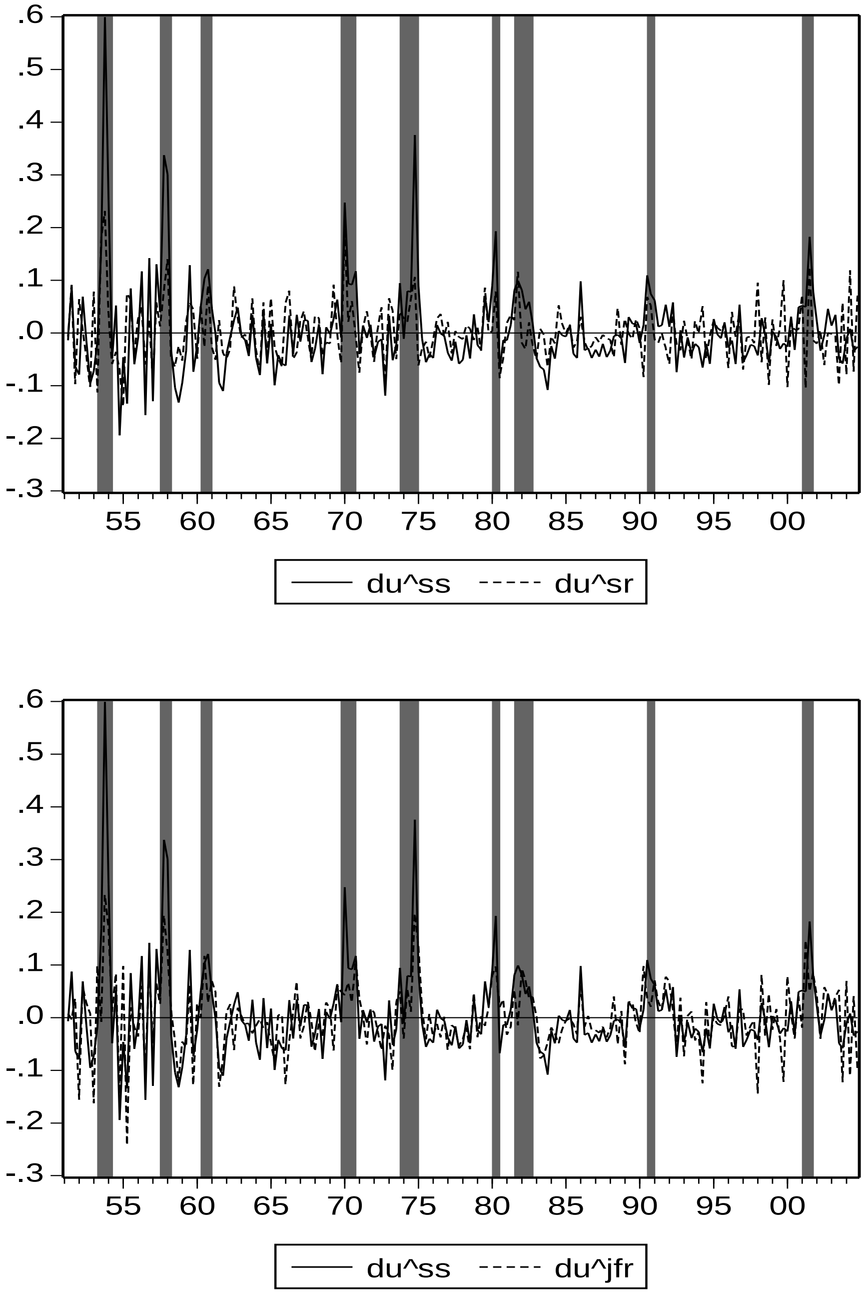
Notes: See notes for Figure 1.

Figure 4: Cross correlation between the cyclical components of the unemployment rate at t and the job finding rate at $t + i$



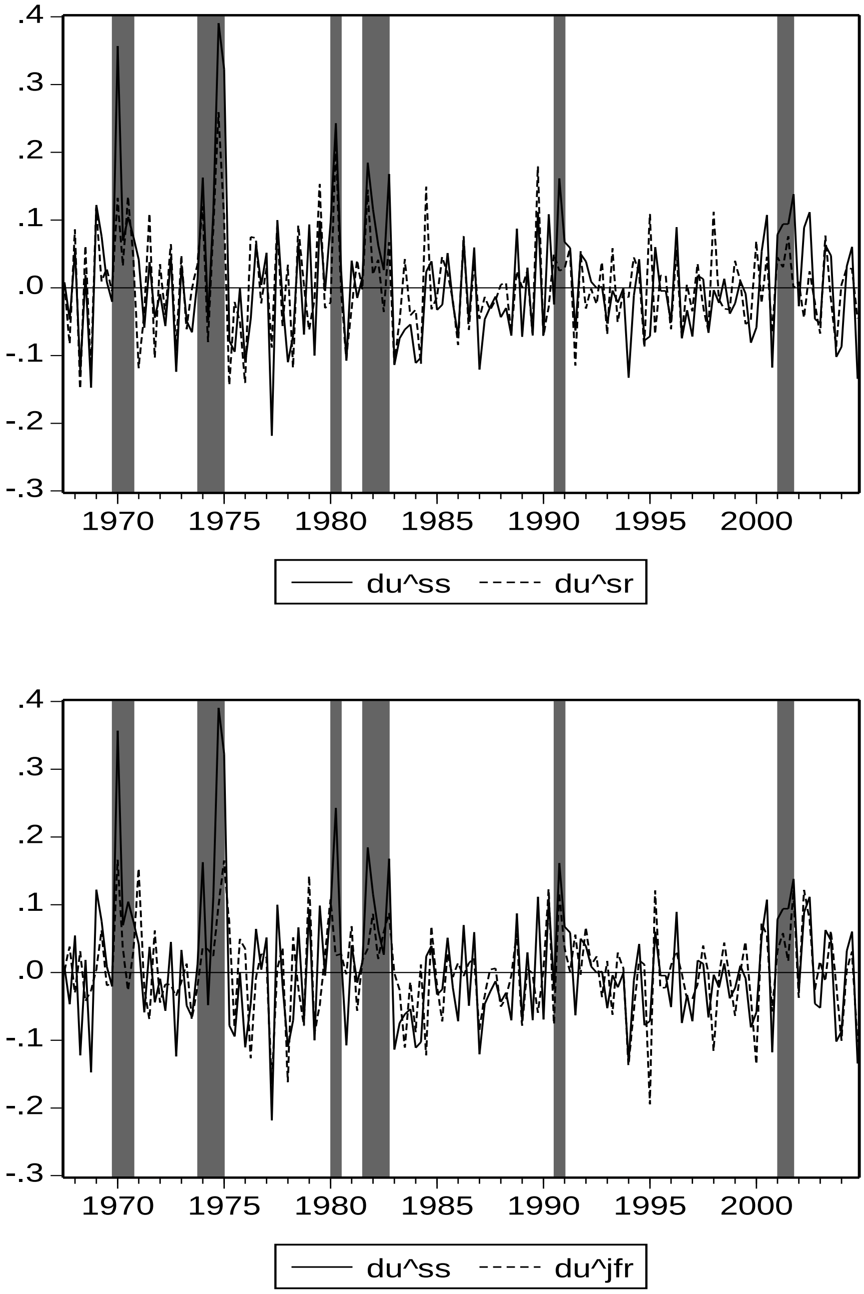
Notes: See notes for Figure 1.

Figure 5: Contributions of job loss and job finding rates to unemployment changes: Shimer (2005a) duration-based data



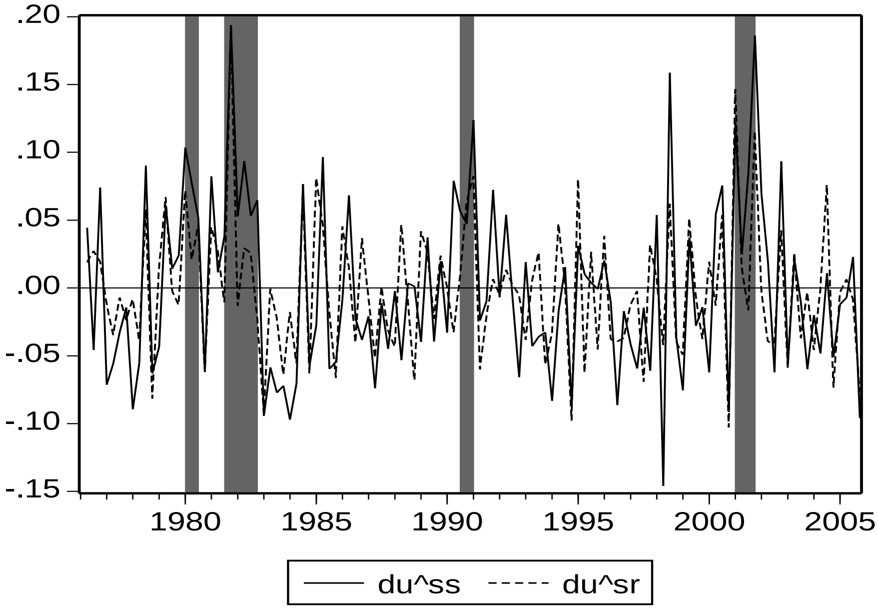
Notes: The quarterly data are downloaded from Rob Shimer's website. Sample period is 1967Q2-2004Q4. See text for the definitions of du_t^{ss}, du_t^{sr}, and du_t^{jfr}. Shaded areas indicate NBER-dated recessions.

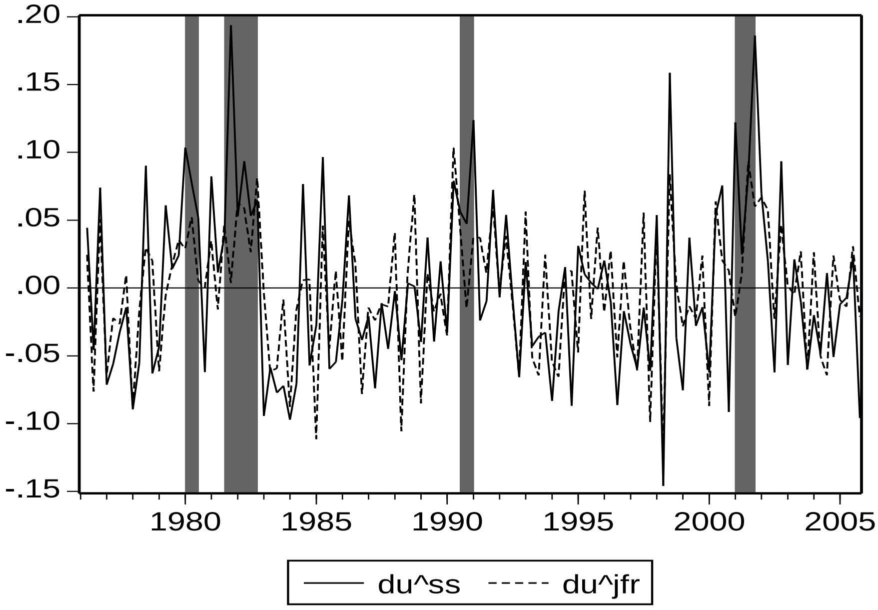
Figure 6: Contributions of job loss and job finding rates to unemployment changes: Shimer (2005a) gross-flow-based data



Notes: The quarterly data are downloaded from Rob Shimer's website. Sample period is 1951Q1-2004Q4. See text for the definitions of du_t^{ss}, du_t^{sr}, and du_t^{jfr}. Shaded areas indicate NBER-dated recessions.

Figure 7: Contributions of job loss and job finding rates to unemployment changes: Fujita and Ramey (2006) gross-flow-based data





Notes: The original data are monthly and constructed by Fujita and Ramey (2006). The quarterly series are computed by averaging the monthly series. Sample period is 1976Q1-2005Q4. See text for the definitions of du_t^{ss}, du_t^{sr}, and du_t^{jfr}. Shaded areas indicate NBER-dated recessions.