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Date: November, 2016

Unemployment Duration and the lasting puzzle

Introduction

The continuous rise in the duration of unemployment despite the irregular economic recovery since mid-2009 has been a major point of concern for economists (Valletta & Kuang).

This paper will develop a multivariate regression model to measure the effect of specific factors (unemployment rate percent change, unemployment population demographics, inflation, labor participation rate and GDP) on unemployment duration (UD) (Bailey 128). My thoughts and questions are found in the [methodology section](#) of this paper.

Arranz & Serrano in their analysis of unemployment in the Spanish labor market discovered that there was an increase in the unemployment rate from 8% to 25% in the period 2007 to 2012; while half of this rate corresponded to long-term unemployment, worker turnover was an important factor in the Spanish labor market (272). Arranz & Serrano mentioned the importance of recurrent employment in the Spanish labor market because of the huge volume of short-term contracts signed in that labor market (272). Seasonal and recurrent factors that affect the level of unemployment can have a significant effect on the duration of unemployment. There are several factors that can affect unemployment duration (UD) as listed in the executive summary above. Unemployment duration is a good measure of job destruction versus job creation and it also provides a good measure of labor market performance. Because the labor market is a significant factor in the performance of an economy, it is important to study this using econometric techniques in order to provide evidence-based conclusions. Solving the puzzle of understanding the reason behind the trend in UD despite the gradual recovery of the USA economy since the 2008 recession is my main concern and I will try to develop an econometric model that can explain this.

Data

The [six independent variables](#) factored-in at the same time can provide good insight that we will use to explain unemployment duration. I have attempted to take away so many terms from the error term in order to provide a better explanation for the UD trend.

Unemployment duration - pud (1949 – 2015): This measures the length of time unemployed people stay unemployed. Unemployment duration is measured in weeks of unemployment. The data was derived from the Federal Reserve Economic Data (FRED) St. Louis as the secondary source but the original source of this data was the Bureau of Labor Statistics (BLS). The paper used this data set as the dependent variable because it was the variable we intended to understand by studying the effect of six independent variables.

Civilian unemployment rate – pu3c (1949-2015): This is the ratio of the number of unemployed people to the total labor force. The secondary source of this data was FRED St. Louis and the primary source was the BLS. My aim of choosing this data was to find out how the civilian unemployment rate could affect the duration of unemployment.

Black or African-American unemployment rate - bur (1973-2015): This is the ratio of the number of Blacks or African-Americans unemployed to the total labor force. The secondary source of this data was FRED St. Louis and the primary source was the BLS. My aim of choosing this data was to find out how the Black or African-American unemployment rate could affect the duration of unemployment. The effect of race on the duration of unemployment is a plausible theory.

White unemployment rate - wur (1955-2015): This is the ratio of the number of Whites unemployed to the total labor force. The secondary source of this data was FRED St. Louis and the primary source was the BLS. My aim of choosing this data was to find out how the White unemployment rate could affect the duration of unemployment. The effect of race on the duration

of unemployment is a plausible theory. Intuitively, our society views Whites as the racial majority and this can have an effect on the length of time they stay unemployed. Logically, one would expect the dominant race to spend less time in the unemployment zone while the minority race will have a longer UD. It is interesting to understand the effect of unemployment population demographics on unemployment duration (UD).

Gross Domestic Product – pgdp (1949-2015): The real GDP is a measure of the value given to all the goods and services produced by a country. Real GDP is a good measure of a country's economic and productivity strength. The data was collected from FRED St. Louis. GDP is a good indicator of the number of firms and the level of production occurring in a country, which can also have an impact on the level of job creation and destruction (job creation or destruction has an impact on UD).

Labor Participation Rate – plpr (1949-2015): This is the ratio of the participating labor force to the total adult population eligible to work. The data was collected from FRED St. Louis as the secondary source and the BLS as the primary source. The number of Americans participating in the labor force has an effect on the number of jobs left for the unemployed (spill-over effect) and this in-turn has an effect on unemployment duration (UD).

Consumer Price Index – pcpi (1949-2015): The consumer price index is a measure of the price paid by urban consumers for a basket of goods and services. The data was collected from FRED St. Louis. Inflation is a good measure of the level of prices in the economy and it can be an incentive for people to stay employed or unemployed and so a good independent variable.

Table 1: Variables for Unemployment Duration Data.

<i>Date</i>	<i>Variables</i>
<i>pu3c</i>	<i>Annual percent change of unemployment duration</i>
<i>bur</i>	<i>Annual percent change of civilian unemployment rate</i>
<i>wur</i>	<i>Unemployment rate - Black or African-American (annual percent change)</i>
<i>pgdp</i>	<i>Unemployment rate – White (annual percent change)</i>
<i>plpr</i>	<i>Annual percent change in real GDP</i>
<i>pcpi</i>	<i>Annual percent change in labor participation rate</i>
	<i>Annual percent change in inflation</i>

Econometric Methodology

My paper will provide a multi-variate regression model to explain the effect of six variables on the duration of unemployment (Bailey 128). The model ran is below:

$$pud_i = \beta_0 + \beta_1 pu3c_i + \beta_2 bur_i + \beta_3 wur_i + \beta_4 pgdp_i + \beta_5 plpr_i + \beta_6 pcpi_i + \epsilon_i \quad (1)$$

Where $\beta_0 = y - \text{intercept}$, $\beta_1 = \text{coefficeint for } pu3c_i$, $\beta_2 = \text{coefficient for } bur_i$, $\beta_3 = \text{coefficeint for } wur_i$, $\beta_4 = \text{coefficient for } pgdp_i$, $\beta_5 = \text{coefficient for } plpr_i$, $\beta_6 = \text{coefficeint for } pcpi_i$, $\epsilon_i = \text{error term}$

Null Hypothesis: An increase in pu3c, bur, wur, plpr and pcpi will lead to an increase in pud.

$$H_0: \beta_1, \beta_2, \beta_3, \beta_5, \beta_6 = +ve$$

Null Hypothesis: An increase in pgdp will lead to a decrease in pud. $H_0: \beta_4 = -ve$

Questions

Is unemployment duration (pud) affected by pu3c, bur, wur, pgdp, plpr, and pcpi?

Is unemployment duration longer for the Black or African American population?

Is unemployment duration longer for the White population?

Does the unemployment rate for Whites or Black/African-American have an effect on the duration of unemployment?

What is the relationship between inflation-consumer price index and unemployment duration (UD)?

What is the relationship between labor participation rate and UD?

What is the relationship between real GDP and UD?

What is the relationship between unemployment rate and UD?

An Ignored Variable-Unemployment benefits duration

The 2009-2011 authorized extension of unemployment insurance (UI) benefits from 26 weeks to a maximum of 99 weeks can be a working theory in understanding unemployment duration (Valletta & Kuang N.p). Estimates from other researchers propose that the impact of prolonging the period of UI benefits has been modest (Valletta & Kuang N.p). Unfortunately, my paper will not be able to answer this question with my econometric model because I do not have the skills best suited to answer this question and because the depth of information needed to produce this econometric model is beyond my reach. A question one can ask here: Is there a significant relationship between length of time for UI benefits and unemployment duration?

R Platform Methodology

This paper makes use of the R platform. The steps involved include:

- Reading the data in the R-platform
- Running a multi-variate model regression
- Running a robust regression to test for Heteroscedastic errors (HC1-type errors using the “AER” package)

Disclaimer: The data presented in [Table 1](#), indicates that all the data presented is a percent change and not the raw data; it is important to reiterate this point (every value in the table shows an increase or a decrease in the variable). The questions above talk about the percent change in the variables mentioned and not in the raw values. The calculation of percent change is provided below:

$$\text{percent change} = \left(\frac{P_1 - P_0}{P_0} \right) * 100 \quad (2)$$

Where P_1 = present value, and P_0 = previous value

```
# Untitled - R Editor
> ols = lm(ud$pu3c ~ ud$pu3c + ud$bur + ud$wur + ud$pgdp + ud$plpr + ud$pcpi)
## We run a multi-variate regression model with 6 independent variables
> summary(ols)
## We summarize the ols model
Call:
lm(formula = ud$pu3c ~ ud$pu3c + ud$bur + ud$wur + ud$pgdp + ud$plpr +
    ud$pcpi)

Residuals:
    Min       1Q   Median       3Q      Max
-13.698  -5.697  -1.418   4.418  16.446

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -9.9584      4.8155  -2.068  0.04588 *
ud$pu3c       0.5600      1.3877   0.404  0.68894
ud$bur        1.0197      0.4445   2.294  0.02773 *
ud$wur       -0.5006      1.1227  -0.446  0.65836
ud$pgdp       3.8503      1.2847   2.997  0.00491 **
ud$plpr      -15.5537      3.3667  -4.620 4.77e-05 ***
ud$pcpi       0.7649      0.5750   1.330  0.19175
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.044 on 36 degrees of freedom
(24 observations deleted due to missingness)
Multiple R-squared:  0.7744,    Adjusted R-squared:  0.7368
F-statistic: 20.59 on 6 and 36 DF,  p-value: 2.696e-10
```

Figure 1: Regression model ran on R platform.

```
> coeftest(ols, vcov=vcovHC(ols, type="HC1"))
## Robust regression looking for heteroscedastic errors|
t test of coefficients:

            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -9.95840      4.42577  -2.2501 0.030649 *
ud$pu3c       0.56000      1.48924   0.3760 0.709102
ud$bur        1.01970      0.48582   2.0989 0.042899 *
ud$wur       -0.50060      1.19211  -0.4199 0.677034
ud$pgdp       3.85030      1.19044   3.2344 0.002613 **
ud$plpr      -15.55367      3.07635  -5.0559 1.266e-05 ***
ud$pcpi       0.76495      0.48302   1.5837 0.122015
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 2: Robust regression checking for heteroscedastic errors.

Results and Discussion

Table 2: Table of Results for Multi-Variate Model

Multi-variate Regression Results (six independent variables)- Figure 2	
Pu3c	0.56 (1.49) [t = 0.38]
Bur	1.02* (0.49) [t = 2.09]
Wur	-0.50 (1.19) [t = -0.42]
Pgdp	3.85* (1.19) [t = 3.23]
Plpr	-15.55* (3.08) [t = -5.06]
Pcpi	0.76 (0.48) [t = 1.58]
Intercept	-9.96* (4.43) [t = -2.25]
N	37
R^2	0.77

Standard errors in parentheses.

(*) indicates significance at $p < 0.05$, two tailed.

Description of results

A one-unit increase in $pu3c$ (unemployment rate) will lead to a 0.56 increase in pud (a p-value of $0.71 > 0.05$ hence insignificant). Intuitively, this was my thinking because as more people become unemployed, it becomes even more difficult to get a job and this leads to higher unemployment duration (we do not have enough evidence to reject the null hypothesis b/c $p\text{-value} > 0.05$).

A one-unit increase in bur (black or African-American (AA) unemployment rate) will lead to 1.02 increase in pud (a p-value of $0.043 < 0.05$ hence significant). We have enough evidence to reject the null hypothesis b/c $p\text{-value} < 0.05$. Intuitively, this was not my thinking because as more black people become unemployed, it becomes even more difficult to get a job and this leads to higher unemployment duration but my results show that my intuition is not right.

A one-unit increase in wur (white unemployment rate) will lead to 0.50 decrease in pud (a p-value of $0.68 > 0.05$ hence insignificant). We do not have enough evidence to reject the null hypothesis even though the sign of the coefficient is different from what was hypothesized. Intuitively, this was not my thinking because as more white people become unemployed, it becomes even more difficult to get a job and this leads to higher unemployment duration but my results show that my intuition is not right. I postulated that whites were better suited to get jobs than blacks or AAs, which does not make the result very surprising.

A one-unit increase in $pgdp$ (real GDP percent change) will lead to 3.85 increase in pud (a p-value of $0.003 < 0.05$ hence significant). Intuitively, this was not my thinking because I expected positive GDP change to signify a better economy with more jobs and this should lead to lower unemployment duration (we have enough evidence to reject the null hypothesis because we have enough evidence). Some concerns here lie in the fact that much of USA domestic goods are produced overseas because jobs are outsourced (just one possible reason).

A one-unit increase in plpr (labor participation rate) will lead to 15.55 decrease in pud (a p-value of $1.27 \times 10^{-5} < 0.05$ hence significant). Intuitively, this was not my thinking because I expected +ve labor participation rate change to mean less jobs for the unemployed and hence higher unemployment duration (we reject the null hypothesis because we have enough evidence). In reflection, the results are not so surprising because one can expect that if more people are participating in the labor force then less people are unemployed and unemployment duration is going to decline.

A one-unit increase in pcpi (consumer price index) will lead to 0.76 increase in pud (a p-value of $0.12 > 0.05$ hence insignificant). Intuitively, this was my thinking because I expected an increase in consumer price index to mean a demand for higher wages by employees and possibly an increase in unemployment because employers will be unwilling to pay very high wages. High levels of unemployment usually lead to longer unemployment duration as proven by my model (we accept the null hypothesis because we do not have enough evidence to reject the null hypothesis).

Conclusion

The methodology used was a multi-variate regression model that tried to explain the effect of six variables on unemployment duration as seen in my [model above](#). The Initial reaction towards this model was that too many variables were included in the model and there might be some complicated results that couldn't be explained. The model worked (the robust regression did not show any HC1-type errors) and some actual results were in-line with the hypothesis proposed in the [econometric methodology](#) section. The model explained 77% of the trend in UD, which is well above half. Moreover, the p-value of the model 2.69×10^{-10} , is statistically significant meaning that we have enough evidence to reject the null hypothesis. The model also worked because it provided the answers to all the questions that were asked in this project. The results were clear and provided

some clues as to where to look for more information that can be used to understand unemployment duration.

Works Cited

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Appendix
Data for Unemployment Duration

(All data is in percent change)

date	pud	pu3c	bur	wur	pgdp	plpr	aegpi	pcpi
1/1/1949	16.3	60.5			-0.5	0.3	-6.3	-1
1/1/1950	20	-14.8			8.7	0.3	5.4	1.1
1/1/1951	-19.2	-36.5			8.1	0.2	7.8	7.9
1/1/1952	-13.4	-9.1			4.1	-0.3	1.2	2.3
1/1/1953	-4.8	-3.3			4.7	-0.3	4.2	0.8
1/1/1954	47.5	93.1			-0.6	-0.2	-6.2	0.4
1/1/1955	10.2	-21.4		-23.53	7.1	0.7	3.9	-0.3
1/1/1956	-13.1	-6.8		-7.69	2.1	1.4	2.9	1.5
1/1/1957	-7.1	4.9		8.33	2.1	-0.7	-0.6	3.4
1/1/1958	33.3	58.1		56.41	-0.7	-0.2	-6.9	2.7
1/1/1959	2.9	-19.1		-21.31	6.9	-0.3	4.6	0.9
1/1/1960	-11.1	0		4.17	2.6	0.2	0.1	1.5
1/1/1961	22.7	21.8		20	2.6	-0.2	-2.8	1.1
1/1/1962	-6.4	-16.4		-18.33	6.1	-0.8	3	1.2
1/1/1963	-4.8	0		2.04	4.4	-0.2	1	1.3
1/1/1964	-5	-7.1		-8	5.8	0	1.8	1.3
1/1/1965	-11.3	-13.5		-10.87	6.5	0.2	4.4	1.6
1/1/1966	-12.7	-15.6		-19.51	6.6	0.7	5.6	3
1/1/1967	-14.6	0		3.03	2.7	0.7	0.6	2.8
1/1/1968	-4.5	-5.3		-5.88	4.9	0	1.9	4.2
1/1/1969	-6	-2.8		-3.13	3.1	0.8	2.7	5.4
1/1/1970	10.1	42.9		48.39	0.2	0.5	-3.1	5.9
1/1/1971	31	20		19.57	3.3	-0.3	-2.6	4.2
1/1/1972	5.3	-6.7		-7.27	5.3	0.3	3.2	3.3
1/1/1973	-16.7	-12.5	-9.62	-15.69	5.6	0.7	5.2	6.3
1/1/1974	-3	14.3	11.7	18.6	-0.5	0.8	-0.4	11
1/1/1975	47.4	51.8	40.95	52.94	-0.2	-0.2	-8.7	9.1
1/1/1976	10.5	-9.4	-5.41	-10.26	5.4	0.7	3.3	5.8
1/1/1977	-9.5	-7.8	0	-11.43	4.6	1	4.3	6.5
1/1/1978	-16.8	-14.1	-9.29	-16.13	5.6	1.6	5.1	7.6
1/1/1979	-9.2	-3.3	-3.15	-1.92	3.2	0.8	3.5	11.3
1/1/1980	10.2	22	16.26	23.53	-0.2	0.2	-2.9	13.5
1/1/1981	16	5.6	9.09	6.35	2.6	0.2	-0.6	10.4
1/1/1982	13	27.6	21.15	28.36	-1.9	0.2	-6.5	6.2
1/1/1983	27.6	-1	3.17	-2.33	4.6	0	-2	3.2
1/1/1984	-9	-21.9	-18.46	-22.62	7.3	0.6	6	4.4
1/1/1985	-13.8	-4	-5.03	-4.62	4.2	0.6	0.6	3.5
1/1/1986	-3.8	-2.8	-3.31	-3.23	3.5	0.6	-1.1	1.9

More
data
available.