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The Connection between Foreign Direct Investment and Unemployment Rate in the United States

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Abstract: Considering that foreign direct investment (FDI) is the principal mechanism for economic globalization, this study analyzes the relationship between FDI and unemployment rate in the US. A vector error correction model was built for checking the long-run and the short-term relationship between FDI inflows and the absolute variation of unemployment rate in the current period compared to previous period. The quarterly data covered the period from 2000 to 2016. The empirical findings showed that only on long-run the changes in the US unemployment rate influenced the FDI. There was not any short-run relationship between FDI and variation in unemployment rate. The macroeconomic policies for attracting FDI in the US should take into account that the foreign investors are sensitive on long-term to the shocks in the unemployment rate.

Keywords: unemployment rate, FDI, vector error correction model, cointegration
JEL Classification: C51, C53

Introduction

Foreign Direct Investment is considered the main mechanism for the economic globalisation. In this context, the main aim of this paper is to analyze the role of FDI in creating jobs for reducing the unemployment rate in the US. Moreover, we will check if the unemployment rate is considered an important economic indicator for foreign investors in selecting US as destination country for their investment.

The unemployment rate is one of the key macroeconomic variables, a lower value being preferred for this indicator. In the United States of America, the causes and measures of unemployment have been deeply analyzed. Strategies to diminish the unemployment rate were proposed throughout time. Demographic factors, education, overall concurrence, economic conditions and automatic are factors that directly affect the unemployment and the job creation.

In USA, the unemployment rate increased fast from 5% at the end of 2007 to a maximum of 10% in October 2009. This measure does not include the people that are outside the workforce, because the results are distort if many of these people stop to look for a job.

A vector error correction model was estimated for studying the long-run and the short-run relationships between unemployment rate variation and FDI in the US. The empirical results indicated that there was only a long-run relationship from unemployment rate to FDI. The economic policies in the US for attracting FDI inflows in the US should consider this aspect that the variations in unemployment rate are an important determinant of FDI.

After this short introduction, a literature review was summarized. The empirical analysis consists in the estimation of the VEC model. In the end, some conclusions are drawn.

1. Literature review

The literature review will focus on the econometric techniques for analyzing the evolution of the unemployment rate. The existence of nonlinearity in the unemployment rate data for USA makes the unemployment rate forecasts based

on nonparametric method to be better than many other linear models for monthly and quarterly data, as Golan and Perloff (2004) showed.

Most of the macroeconomic series, including the data sets for unemployment rate, need first differencing for becoming stationary (Nelson and Plosser, 1982. Since the publication of this paper, many studies were dedicated to the stationart properties of macroeconomic time series. For USA economy, comparisons between natural rate and hysteresis assumption were made by many researchers (Song and Wu, 1997; Leon-Ledesma, 2002; Cheng et al., 2012). These analyses provided mixed evidence regarding the fluctuations' nature in USA unemployment rates. Payne etal.showed, using augmented Dickey and Fuller (ADF)test, that all state unemployment rates are non-stationary (Payne etal., 1999).

León-Ledesmaapplied the panel unit root test of Im etal. to check for unemployment hysteresis in the US countries and the EU states, against the alternative hypothesis of a natural rate (León-Ledesma, 2002; Im etal., 2003). The most suitable assumptions were: natural rate for the USA countries and hysteresis for EU members.

Clemente etal.provided empirical results for the rejection of the unit root existence. This result is dependent by the data level of aggregation (Clemente etal., 2005). The stochastic character of unemployment rate was checked by Cheng etal. under the assumption of cross -sectional dependence on a panel of USA countries for level data (Cheng etal., 2012). If the data of the economic recession are included, the authors obtained a significant evidence for the existence of a non-stationary common component.

Cover and Mallick show the existence of unit roots in unemployment rate series for USA using ADF and the Phillips–Perron (PP) tests (Cover and Mallick, 2012).This result is also obtained by stronger unit root tests like that of Elliott etal. (ERS) and that of Kwiatkowski etal. (KPSS) (Elliott etal., 1996; Kwiatkowski etal., 1992).

Many studies in literature analyzed the variance between USA countries unemployment rates. For example, Partridge and Rickman find that unemployment between USA countries is quite persistent because of local political and economic factors that affect state behavior (Partridge and Rickman, 1997).

These effects include a large variety of factors, like regional, industrial, demographic and non-demographic ones. Payne et al. utilized bivariate Engle-Granger cointegration tests to show that cointegration between an USA country and national unemployment rates was detected in 2 out of 50 cases (Payne et al., 1999). The unemployment persistence was analyzed using fractionally integrated (ARFIMA) models by Gil-Alana (Gil-Alana, 2002).

Conley and Topaobtained a statistically significant and positive degree of spatial dependence in the raw unemployment rates repartition (Conley and Topa, 2002). Nistor identified asymmetries across countries in unemployment behavior (Nistor, 2009).

Havet and Penotfound little support for Oswald's hypothesis (Havet and Penot, 2010). This is validated in the study of Farberwho made an analysis of the USA labour market for the period starting with the Great Recession (Ferber, 2012). There was no evidence that unemployed mobility was diminished by housing market crisis.

Blanchflower and Oswaldused panel data for USA countries to investigate the relationship between homeownership and unemployment (Blanchflower and Oswald, 2013). The high levels of homeownership have the tendency to destroy jobs with a lag of only one year.

The non-linearities in unemployment rate data series were modeled using: Markow- switching model employed by Bianchi and Zoega, non-linear fractional integration background of Caporale and Gil-Alana and Smooth Transition AutoRegressive (STAR) models used by Skalin and Teräsvirta (Bianchi and Zoega, 1998; Caporale and Gil-Alana, 2006; Skalin and Teräsvirta; 2002). A procedure to identify breaks was proposed by by Gil-Alana in order to consider for non-linear structures (Gil-Alana, 2007).

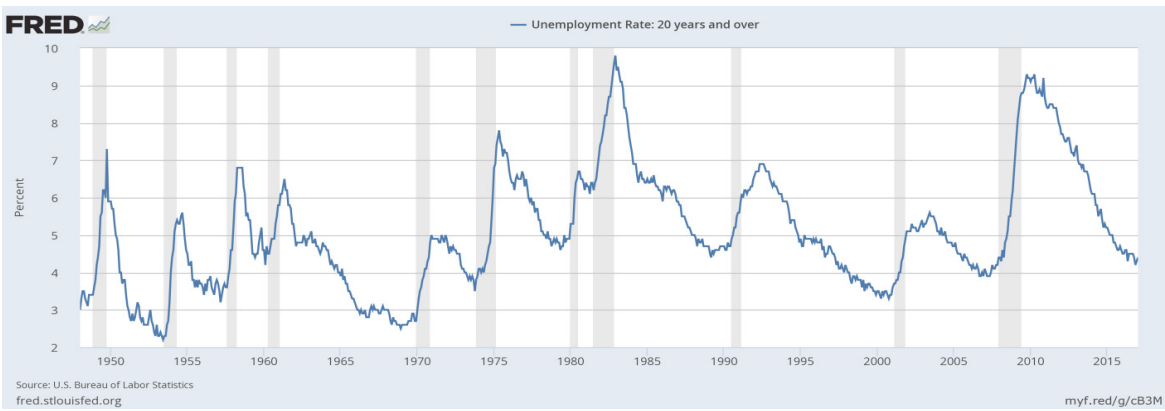
2. Econometric models for monthly unemployment rate in USA

In the context of the recent economic crisis, the unemployment rate has faster increased in USA. These high fluctuations in the unemployment might have a significant impact on FDI. Two macroeconomic variables are considered in this research: FDI inflows (million dollars, comparable prices, 2000=100) and unemployment rate. The data have quarterly frequency. The period of analysis is

2000: Q1- 2016: Q4. The maximum value of unemployment rate was registered in October 2009 (10%). Since this moment it decreased very slow, arriving at 5.1% in August 2015. This value was registered at the beginning of the crisis in March 2008. The data are provided by U.S. Bureau of Labor Statistics. The quarterly unemployment rate was computed using the monthly data and taking the value at the end of each quarter.

First of all, the unit roots presence is detected using Augmented Dickey-Fuller test in all variant (model with trend and intercept, model with intercept and model without trend and intercept.

Figure. 1. Monthly unemployment rate in USA (1948:Q1-2016:Q4)



Source: U.S. Bureau of Labor Statistics

The results in Table 1 indicated that FDI data series is integrated of order 1 (I(1)) while unemployment rate is integrated of order two (I(2)) at 5% level of significance. A data series being integrated of order 2, the ARDL (autoregressive distributed lag) approach cannot be applied.

Table 1. Augmented Dickey-Fuller test for transformed data series of inflation and unemployment rate

Variable	Model	ADF statistic		Critical values
Unemployment rate in second difference	Model with trend and intercept	–4.874649	1% Critical Value	–4.1083
			5% Critical Value	–3.4812
			10% Critical Value	–3.1682
	Model with intercept	–4.917778	1% Critical Value	–3.5362
			5% Critical Value	–2.9077
			10% Critical Value	–2.5911
	Model without trend and intercept	–4.956155	1% Critical Value	–2.5994
			5% Critical Value	–1.9456
			10% Critical Value	–1.6185
FDI in first difference	Model with trend and intercept	–4.167600	1% Critical Value	–4.1059
			5% Critical Value	–3.4801
			10% Critical Value	–3.1675
	Model with intercept	–3.352728	1% Critical Value	–3.5345
			5% Critical Value	–2.9069
			10% Critical Value	–2.5907
	Model without trend and intercept	–6.566349	1% Critical Value	–2.5994
			5% Critical Value	–1.9456
			10% Critical Value	–1.6185

According to lag length criteria, the optimal lag for the relationship between FDI and the absolute variation of the unemployment rate is 1. This result will be used when applying the cointegration test.

Table 2. Selection of optimal lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–825.8166	NA	3.30E+09	27.59389	27.66370	27.62119
1	–807.3896	35.01125*	2.04E+09*	27.11299*	27.32242*	27.19491*
2	–805.1901	4.032337	2.17E+09	27.17300	27.52206	27.30954
3	–803.7994	2.456952	2.37E+09	27.25998	27.74866	27.45113
4	–802.8720	1.576629	2.63E+09	27.36240	27.99070	27.60816
5	–798.4831	7.168513	2.61E+09	27.34944	28.11736	27.64981
6	–796.6765	2.830319	2.82E+09	27.42255	28.33010	27.77754
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: authors' calculations

The Johansen cointegration test will be applied when the lag is 1. The variables are denoted by FDI and D1_U, which represents the unemployment rate in first difference. The trace test and the maximum eigenvalue test indicated that at least one cointegration relationship might exist between quarterly FDI and the variation in unemployment rate in the US.

Table 3. The results of Johansen cointegration test

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	0	1	2	1	2
Max-Eig	0	1	2	1	2

Source: authors' calculations

A vector error correction model is estimated for FDI and the variation in unemployment rate:

$$D(D1\_U) = C(1)*(D1\_U(-1) + 0.0002192432724*FDI(-1) - 45.37489341) + C(2)*D(D1\_U(-1)) + C(3)*D(FDI(-1)) + C(4) \quad (1)$$

$$D(FDI) = C(5)*(D1\_U(-1) + 0.0002192432724*FDI(-1) - 45.37489341) + C(6)*D(D1\_U(-1)) + C(7)*D(FDI(-1)) + C(8) \quad (2)$$

If the coefficients C(1) and C(5) are negative, then a long-run relationship between the two variables is confirmed. If C(3) and C(6) are different from 0 from statistical point of view, a short-run relationship between variables is identified.

$$D(D1\_U) = 0.002225841536*(D1\_U(-1) + 0.0002192432724*FDI(-1) - 45.37489341) - 0.394503708 2*D(D1\_U(-1)) - 1.142524135e-07*D(FDI(-1)) - 0.0001891365808 \quad (3)$$

$$D(FDI) = -3096.690581*(D1\_U(-1) + 0.0002192432724*FDI(-1) - 45.37489341) + 5070.275888*D(D1\_U(-1)) - 0.02776565192*D(FDI(-1)) + 1710.165153 \quad (4)$$

C(1) is positive and then, there is not a long-run causality from FDI to variation in the unemployment rate. However, C(5) is negative and a long-run causal relationship was detected from unemployment variation to FDI. In economic terms, on long-run, the foreign investors are influenced by the unemployment rate fluctuations in the US when they decide to invest in this country. On the other hand, on long-term, the FDI had not had a significant impact on unemployment rate in the US.

The Wald test is applied to check if the other coefficients (C(3) and C(6)) are statistically significant.

Table 4. The results of Wald test

Null Hypothesis:	C(3)=0, C(6)=0			
Chi-square	0.041263		Probability	0.979580

Source: authors' calculations

The probability associated to chi-square statistic is higher than 0.05. Therefore, there is not any short-run relationship between FDI and fluctuations in unemployment rate in the US at 5% level of significance.

Conclusions

The unemployment rate evolution in USA is carefully followed by American Administration in order to propose suitable strategies for reducing unemployment. In this paper, we checked if FDI could explain the variations in the unemployment rate.

A vector error correction model was estimated for studying the long-run and the short-run relationships between unemployment rate variation and FDI in the US. The empirical results indicated that there was only a long-run relationship from unemployment rate to FDI. The economic policies in the US for attracting FDI inflows in the US should consider this aspect that the variations in unemployment rate are an important determinant of FDI.

The research is limited by the fact that other variables were not introduced in the VEC model. In a future research, variables like inflation rate and GDP rate will be introduced.

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