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## The reaction of the WSE to U.S. employment news announcements

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dozwolonego użytku.

Milena Suliga\*, Tomasz Wójtowicz\*

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### 1. Introduction

From the financial and economic literature it follows that macroeconomic news plays important role in asset pricing as it carries information about conditions of the economy and possible future government actions. Previous studies show that not only domestic news is significant for investors. Sometimes information about other economies is even more important, particularly when it is the U.S. economy. Such conclusion is obtained by e.g. Nikkinen and Sahlström [12], Będowska-Sójka [3], Harju and Hussain [11] and Gurgul et al. [10]. Their studies are performed on the basis of daily data as well as intraday data.

Using daily data Nikkinen and Sahlström [12] study the impact of macroeconomic announcements on German and Finnish equity markets. The data set considered in the paper consist of monthly reports from Germany, Finland and the U.S. involving three prominent macroeconomic indicators, namely Consumer Price Index, Producer Price Index and Unemployment Rate. Results of the study show that in the period from January 1996 to December 1999 neither the German nor the Finnish market is sensitive to domestic macroeconomic news but both of them react to U.S. announcements. UR and PPI influence the implied volatility on both stock markets while CPI reports have an impact on uncertainty on the Finnish market only.

The issue whether the U.S. economy is an important source of information to European investors is also studied by Harju and Hussain [11]. They use a wide set of U.S. macroeconomic releases from September 2000 to March 2006. Harju

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and Hussain study their impact on high-frequency returns of four European indices: CAC40, DAX30, FTSE100 and SMI. For all of these stock markets Harju and Hussain find that intraday returns as well as volatilities react immediately to U.S. macroeconomic surprises.

In the similar manner Będowska-Sójka [3] studies the reaction of WIG20, DAX and CAC40 indices to announcements of eight types of US macroeconomic indicators, published between November 2007 and May 2009. She analyzes the impact of individual types of announcements as well as market reaction to “good” and “bad” news. Będowska-Sójka shows that U.S. macroeconomic news changes both returns and volatilities. Unemployment Rate announcements, on the average, decrease returns and increase volatilities of all three European indices under study.

The impact of announcements about CPI, UR and Industrial Production in the U.S. on the Polish stock market is also studied by Gurgul et al. [10]. The authors consider daily returns of WIG20 from February 2004 to December 2011. Using the event study analysis Gurgul et.al. show that investors significantly respond to CPI and IP announcements while UR releases seem to have no impact on the Warsaw Stock Exchange.

The abovementioned papers prove that releases of U.S. macroeconomic indicators do really impact developed as well as emerging European equity markets. This point of view is reinforced by Andersen et al. [2] who investigate the impact of U.S. fundamentals releases on stock, bond and exchange markets in the U.S., the UK and Germany. Their data set consists of 22 U.S. macroeconomic indicators and 5-minute returns from July 1, 1998 to December 31, 2002. Andersen et al. not only confirm the significant impact of U.S. announcements on the conditional means of European stock markets but also show that the strength and direction of the impact depends on the state of the U.S. economy i.e. traditionally bad information have a negative impact on European markets during contractions but the effect is positive while expansions. This is in line with the previous results of Boyd et al. [4] who study the impact of the U.S. Unemployment Rate announcements on S&P500 stock index in the period from February 1948 to December 2000. Boyd et al. discover that during contractions average stock returns are positive on the day when “good” news is announced and negative on the day of “bad” news. On the other hand, during expansions the situation is quite different – averages are positive on the day of the announcement regardless of the information contained in the release. Moreover, the market reaction to an unexpected rise in unemployment is positive in expansions and negative in contractions. Following Campbell and Mei [5] Boyd et al. explain that during contractions UR releases carry important information about interest rates, while during contractions in UR

announcements dominates information about equity risk premium and future corporate dividends.

From the abovementioned papers it follows that the state of the labor market is one of the most frequently examined macroeconomic issue. In fact, the Employment Report published monthly by the U.S. Bureau of Labor Statistics is one of the most significant U.S. macroeconomic announcements ([1],[2],[6]). However, in the majority of papers the state of the U.S. labor market is characterized by the Unemployment Rate which is only one of the indicators in the Report. Other important indicators are e.g. Average Hourly Earnings, Average Workweek, Nonfarm Payrolls, Manufacturing Payrolls Change and Private Payrolls Change. All of these indicators are released simultaneously and jointly affect price formation processes. Thus, the reaction of the stock markets on the Employment Report depends on the level of each of these indicators. Studies that focus only on the value of the Unemployment Rate ignore the fact that it describes one side of the employment situation in the U.S. and other indicators provide additional information. In particular, there could be an indicator that is more informative and have greater impact on investor behavior than UR.

In this paper we analyze the impact of four indicators published in the Employment Report on the Warsaw Stock Exchange. On the basis of high-frequency WIG returns from January 2004 to November 2012 we evaluate the significance of each of these indicators in price formation processes on the WSE. To indicate the most important indicator we also study the joint impact of some pairs of indicators from the Employment Report. The analysis in the paper estimates the duration and direction of the impact of U.S. employment news on the Polish stock market.

The structure of the paper is as follows. Data and methodology applied in the study are described in detail in the next section. Empirical results of the event study analysis are presented in Section 3. The final section concludes the paper.

## 2. Data and methodology

From the group of indicators that are published monthly in Employment Reports of the Bureau of Labor Statistics we choose four, that are commonly provided by information agencies and business and financial services. These are Unemployment Rate, Nonfarm Payrolls, Average Hourly Earnings and Average Workweek. Each of them describes various aspects of the employment situation and its changes can lead to different investor reaction. Decrease in the

Unemployment Rate is usually good news. However, too low UR can be interpreted as a symptom of labor shortage leading to wage growth. The level of the economic activity is reflected by changes in Nonfarm Payrolls, which measure monthly changes in the number of employed outside the farming industry. The more workplaces, the faster economic growth. Nevertheless, for the economy in the mature phase of expansion rapid growth of the employment can lead to inflationary pressures. Average Workweek expresses the weekly amount of working hours. Rising Average Workweek causes the increase in employment and supports production gains while decreasing Average Workweek could lead to a decline in employment. Wage pressure is represented by increase in Average Hourly Earnings. It is commonly believed that the upward tendency of this indicator can yield higher inflation. On the other hand, product prices do not increase if the wage growth are caused by the growth of productivity because the unit labor costs are unchanged.

In this paper we examine the reaction of stock prices on the WSE to unexpected news about each of the abovementioned indicators. Dates and hours of announcements as well as released values and their forecasts come from [www.bloomberg.com](http://www.bloomberg.com) and cover the period from January 2004 to November 2012.

Employment Reports are released on the first Friday of the month at 8:30 EST (Eastern Standard Time) i.e. usually at 14:30 CET (Central European Time). Due to differences in introducing the Daylight Saving Time in the U.S. and Europe one announcement (November 2, 2012) arrived the WSE at 13.30 CET. From the data sample we exclude 5 events when there was no trading on the WSE in the day of the announcement. It gives the total number of 102 report releases.

For each indicator under study we compared the announced value with its previous forecast and thus we divided all announcements into three clusters: "below consensus", "in line with consensus" and "above consensus". Unexpected news are connected with events in the first and third clusters. To analyze the impact of these unexpected news on the WSE we applied the event study. More precisely, we applied nonparametric rank test proposed by Corrado and Zivney [9] to test the significance of abnormal 5-minute returns of WIG.

It is well established in financial literature that intraday volatility of high-frequency returns is higher at the beginning and at the end of a trading session. In this study we consider the pre-event window of the length 48 returns (four hours) and the event window of the length of 35 minutes. The event window consists of seven 5-minute returns: two returns before the announcement, the event return and four returns after the release. The Employment Report is usually released at 14.30 CET, thus the earliest return in pre-event window is from

10.25 CET and the latest return in event window is from 14.55 CET. When the employment report is released at 13.30 CET then we use 5-minute returns from 9.25 to 13.55 CET i.e. 25 minutes after opening of the trading session and more than three hours before closing. Such pre-event and event windows do not include returns from the beginning nor the end of the trading session when increased volatility is observed.

If we denote the moment of the news release by  $t = 0$  then the pre-event window are  $t = -51, \dots, -3$  while  $t = -2, \dots, 4$  are event window. Abnormal returns  $AR_{it}$  for  $i$ -th event are defined as differences between actual returns and the mean from the pre-event window. For each event abnormal returns are standardized:

$$SAR_{it} = AR_{it} / S(AR_t),$$

where

$$S(AR_t) = \sqrt{\frac{1}{47} \sum_{t=-51}^{-3} AR_{it}^2}$$

is abnormal returns standard deviation in the pre-event window. Increased volatility of abnormal returns is frequently observed in the event window ([7], [8]). It is also visible in the case of the Employment Report announcements.

Figure 1 presents cross-sectional standard deviations of abnormal returns around the time of the announcement, i.e. at the end of the pre-event window ( $t = -9, \dots, -3$ ) and in the event window ( $t = -2, \dots, 4$ ). It shows that just after the event, for  $t > 3$ , cross-sectional volatility of abnormal returns increases. To control for this event-induced shift in the cross-sectional variance we adjust standardized abnormal returns:

$$SAR'_{it} = \begin{cases} SAR_{it} & t = -51, \dots, 0 \\ SAR_{it} / S(SAR_t) & t = 1, \dots, 4, \end{cases}$$

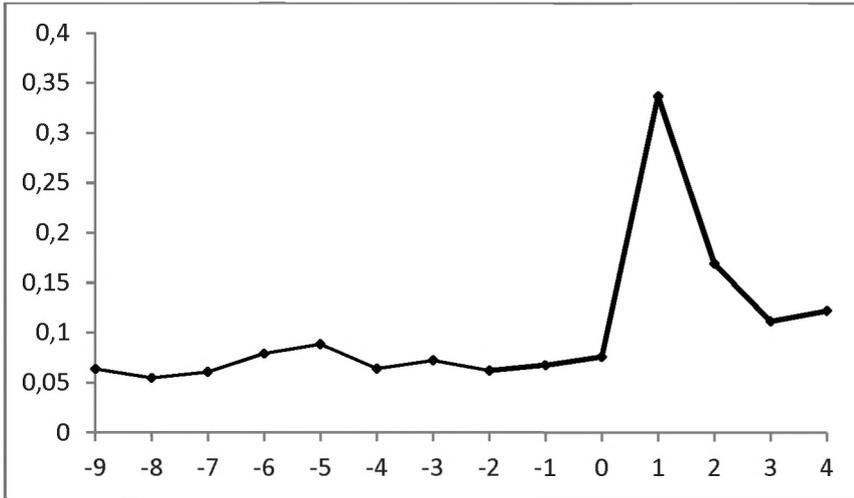
where

$$S(SAR_t) = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (SAR_{it} - \bar{SAR}_t)^2}$$

is cross-sectional standard deviation and  $N$  is the number of events in a cluster. We tested the significance of abnormal returns for each  $t$  in the event window separately thus for each  $t_0 = -2, \dots, 4$  Corrado-Zivney  $T'_{cz}$  statistics is defined as ([7]):

$$T'_{cz}(t_0) = \frac{1}{\sqrt{N}} \sum_{i=1}^N \frac{\left( \text{rank}(SAR'_{it_0}) - \frac{n+1}{2} \right)}{\sqrt{n(n+1)/12}},$$

where  $n$  is the length of the pre-event window and  $\text{rank}(SAR'_{it0})$  denotes the rank of  $SAR'_{it0}$  within the vector consisting of standardized abnormal returns from the pre-event window and  $SAR'_{it0} \cdot T'_{cz}$  statistics is asymptotically normally distributed. The advantage of the nonparametric Corrado-Zivney test is that it does not need any assumption of abnormal returns normality.



**Figure 1.** Cross-sectional standard deviations of abnormal returns  $AR_{it}$  of WIG in the part of the pre-event window ( $t = -9, \dots, -3$ ) and in the event window ( $t = -2, \dots, 4$ ).

### 3. Empirical results

In the first step we examined the impact of each indicator separately ignoring interrelations between them as if the Employment Report contained information only about this one indicator. It means that for each indicator and for the same set of abnormal returns data computed for all Employment Report announcements we define different events according to the value of this indicator. Detailed results of the event study analysis for Unemployment Rate, Average Hourly Earnings and Average Workweek i.e. average abnormal returns in the event window and Corrado-Zivney statistics  $T'_{cz}$  are presented in Table 1 for all clusters. Nonfarm Payrolls equals consensus only in one case so only the impact of unexpected news about NP is examined and results of the event study for NP are presented separately in Table 2. For each indicator the number of events in each cluster are also reported in Tables 1 and 2.

**Table 1**

Reaction of intraday WIG returns to unexpected news in the Employment Report of the U.S. Bureau of Labor Statistics in the period from January 2004 to November 2012

	Below consensus		In line with consensus		Above consensus	
	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$
<b>Unemployment Rate</b>						
<i>t</i>	44 events		30 events		28 events	
-2	0.007	0.24	-0.010	-0.68	0.012	1.40
-1	-0.004	-0.10	0.000	0.81	-0.004	-0.18
0	0.012	1.11	0.017	1.64	0.009	0.84
1	-0.016	-0.72	0.042	1.04	-0.091	-1.08
2	0.005	0.38	-0.016	-0.60	-0.018	-0.69
3	0.017	0.81	0.021	1.59	0.019	0.99
4	-0.012	-0.26	0.005	-0.09	-0.025	-0.35
<b>Average Hourly Earnings</b>						
	41 events		29 events		32 events	
-2	0.006	0.42	-0.004	0.02	0.006	0.44
-1	-0.015	-1.19	-0.006	0.44	0.015	1.43
0	-0.008	0.43	0.031	2.58*	0.022	0.97
1	0.013	0.34	-0.047	-0.70	-0.037	-1.00
2	-0.032	-0.98	-0.020	-0.97	0.035	1.29
3	0.020	2.06**	-0.001	0.19	0.036	0.63
4	-0.010	-0.57	-0.005	-0.02	-0.016	-0.09
<b>Average Workweek</b>						
	35 events		45 events		22 events	
-2	0.013	0.89	-0.001	-0.23	-0.003	0.34
-1	-0.007	-0.02	-0.016	-1.07	0.031	2.16**
0	-0.003	0.26	0.027	2.80*	0.009	0.43
1	-0.035	-0.60	-0.046	-0.87	0.057	0.43
2	-0.049	-1.47	0.035	1.40	-0.028	-0.94
3	0.041	1.68***	-0.012	-0.32	0.046	1.95***
4	-0.001	0.38	-0.017	-0.57	-0.013	-0.88

\*, \*\*, \*\*\* - significant at 1%, 5% and 10% level respectively

It should be noted here, that new information released at  $t = 0$  can be reflected in stock prices only for  $t$  greater than 0. Thus, the most important in the analysis of the reaction of WIG to the Employment Report is the value and significance of  $\overline{AR}_1$ .

When the announced value of the Unemployment Rate is different from expectations stock prices decrease in the first five minutes after the announcement in both clusters “below consensus” and “above consensus”. On the other hand, when the unemployment rate is in line with expectations stock prices increase about 0.042%. It indicates that any unexpected information about unemployment is regarded by investors as bad news while UR in line with expectations is seen as good news. However, changes in abnormal returns induced by UR announcements are small when compared with returns standard deviation and hence become insignificant. These results confirm that in general the value of the unemployment rate in the U.S. does not impact stock prices. Similarly to UR, there is no visible impact of the announced value of the Average Hourly Earnings. The absolute value of  $T_{cz}$  statistics in each cluster for  $t = 1$  is smaller than any reasonable critical value. Opposite to UR, investors react differently depending on the value of AHE. The announcement below consensus is followed by positive average abnormal returns (0.013%) while AHE greater than forecast implies negative  $\overline{AR}$  (-0.037%). It suggests that when AHE is smaller than expected it is seen as good news while AHE greater than expected is bad news. Corrado-Zivney test statistics is significant at least at 5% level only in two cases: when the announcement is below consensus ( $t = 3$ ) and when the announcement is in line with consensus ( $t = 0$ ). The significantly positive change in abnormal returns just before the announcement in line with forecasts is also observed when the Average Workweek is taken into account. AW shorter than expected is accompanied by negative average abnormal returns up to 10 minutes after the release. Then highly positive  $\overline{AR}_3$  is observed and its significance is confirmed by Corrado-Zivney test. The reaction of returns to AW below consensus in the first 10 minutes after publication of the Employment Report means that the reduction of working time in the U.S. is bad news for investors. The opposite reaction is visible for AW above consensus when at first investors react positively. In this cluster increase in stock prices is confirmed by significant  $T_{cz}$  statistics for  $t = 3$  It means that 15 minutes after unexpected news about Average Workweek highly positive investor reaction is observed on the WSE irrespective of the value of news.

The reaction of WIG returns to Nonfarm Payrolls is different from the reaction of any other indicator analyzed in this paper. When all the data are divided according to unexpected news about NP, then the strongest reaction to the Employment Report is observed. Moreover, the impact of news about NP is the easiest to interpret. When NP is below consensus stock prices on the WSE decrease in average about -0.144% in the first five minutes after information release. This change is significant at the 1% level ( $T_{cz} = -3.96$ ). After then there is no other significant changes. It means that NP smaller than expected is bad news to investors and their reaction is very strong, very fast and disappears after five minutes. The opposite reaction just after news release is observed when the announced value of NP is greater than

consensus ( $\overline{AR}_1 \cong 0.198\%$ ). Hence, NP above consensus is admittedly good news to the stock market as evidenced also by significantly positive  $\overline{AR}_3$  and by positive average abnormal returns in almost the entire event window.

**Table 2**  
Reaction of intraday WIG returns to unexpected news about Nonfarm Payrolls in the period from January 2004 to November 2012

<i>t</i>	Below consensus (64 events)		Above consensus (37 events)	
	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$
-2	0.009	1.06	-0.006	-0.42
-1	-0.004	0.29	0.001	0.18
0	0.007	1.41	0.023	1.96***
1	-0.144	-3.96*	0.198	4.07*
2	-0.010	-0.42	-0.008	-0.11
3	0.010	0.38	0.035	2.23**
4	-0.020	-0.80	0.010	0.77

\*, \*\*, \*\*\* - significant at 1%, 5% and 10% level respectively

Results in Table 1 and 2 indicate that unexpected changes in Nonfarm Payrolls are the major determinant of investor reaction to news about the U.S. labor market included in the Employment Report. A significant reaction of WIG returns just after the Employment Report release is observed only when announcements are divided according to the value of NP. Table 1 and 2, however, describe the reaction of WIG returns to information contained separately in each of the indicators. To verify that stock prices change mainly according to news about Nonfarm Payrolls we repeat the above computations taking into account unexpected news about NP together with unexpected news about each of the other indicators. This allows us to determine the joint impact of pairs of the indicators. Because we examine the impact of unexpected news, hence for each pair of the indicators we divide data into four clusters: both indicators are above consensus, both are below consensus and one indicator is above consensus while the other is below (there are two such clusters). Detailed results of this event study are reported in Table 3 where we present mean abnormal returns  $\overline{AR}_t$  in the event window together with  $T_{cz}$  statistics. The small number of events in some clusters could result in the low power of the performed tests. However, results in Table 3 clearly indicate the importance of Nonfarm Payrolls. In each cluster the mean abnormal return for  $t = 1$  is significant at least at 10% level and, what is even more important, the sign of  $\overline{AR}_t$  depends only on the value of unexpected news about NP.  $\overline{AR}_t$  is negative when NP is below

consensus and  $\overline{AR}_1$  is positive when NP is above consensus irrespective of the value of the other indicator. It confirms results from Table 1 and 2 that investors on the WSE react mainly to information contained in Nonfarm Payrolls and the values of other indicators in the Employment Report are significantly less important.

**Table 3**  
Reaction of intraday WIG returns to unexpected news about pairs of indicators published in the Employment Report in the period from January 2004 to November 2012

	Nonfarm Payrolls below consensus				Nonfarm Payrolls above consensus			
	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$	$\overline{AR}(\%)$	$T_{cz}$
$t$	UR below consensus (31 events)		UR above consensus (17 events)		UR below consensus (17 events)		UR above consensus (11 events)	
-2	0.009	0.55	0.021	1.50	0.004	-0.19	-0.001	0.38
-1	-0.004	-0.08	-0.007	-0.15	-0.003	0.11	0.001	-0.10
0	0.009	1.33	0.003	0.20	0.021	0.33	0.019	1.20
1	-0.176	-3.93*	-0.227	-2.57**	0.338	3.10*	0.119	2.08**
2	-0.008	0.12	-0.024	-0.82	0.046	0.94	-0.008	-0.18
3	0.003	-0.09	0.017	0.72	0.040	1.10	0.022	0.61
4	-0.020	-0.17	-0.045	-1.07	0.006	-0.27	0.007	1.52
$t$	AHE below consensus (25 events)		AHE above consensus (21 events)		AHE below consensus (17 events)		AHE above consensus (11 events)	
-2	0.010	0.38	0.012	0.88	0.003	0.39	-0.006	-0.46
-1	-0.022	-1.14	0.018	1.33	-0.004	-0.36	0.009	0.59
0	-0.024	-0.45	0.022	0.97	0.016	1.75***	0.023	0.31
1	-0.105	-1.92***	-0.163	-2.47**	0.181	2.70*	0.205	1.65***
2	-0.035	-0.77	0.022	0.48	-0.021	-0.29	0.060	2.10**
3	0.035	2.00**	0.025	-0.26	-0.011	0.48	0.056	1.35
4	-0.024	-1.08	-0.037	-0.72	0.011	0.16	0.023	1.63
$t$	AW below consensus (26 events)		AW above consensus (13 events)		AW below consensus (8 events)		AW above consensus (12 events)	
-2	0.008	0.45	-0.002	0.43	0.035	1.31	-0.003	0.02
-1	-0.013	-0.25	0.041	1.73***	0.014	0.63	0.018	1.31
0	-0.004	0.59	0.011	0.54	0.001	-0.23	0.006	0.05
1	-0.120	-2.12**	-0.155	-2.72*	0.219	3.11*	0.312	3.03*
2	-0.072	-2.03**	0.004	0.02	0.033	1.41	-0.066	-1.63
3	0.029	1.02	0.039	0.82	0.066	1.24	0.055	1.87***
4	0.000	0.35	-0.027	-0.58	-0.002	0.15	0.004	-0.66

\*, \*\*, \*\*\* - significant at 1%, 5% and 10% level respectively

## 4. Conclusions

The Employment Report published monthly by the U.S. Bureau of Labor Statistics is one of the most significant U.S. macroeconomic announcements. In this paper we examined the impact of four macroeconomic indicators included in the Report (Unemployment Rate, Nonfarm Payrolls, Average Hourly Earnings and Average Workweek) on stock prices on the Warsaw Stock Exchange in the period from January 2004 to November 2012. To analyze the impact of unexpected information on 5-minute returns of WIG we apply the event study. The analysis shows that generally investors react to announcements about the U.S. labor market in the first five minutes after information release. An unexpected increase in Average Hourly Earnings is seen by investors as bad news while increase in Average Workweek or Nonfarm Payrolls is good news. Reaction to unexpected information about the Unemployment Rate is negative. The comparison of investor reaction to indicators under study shows that Nonfarm Payrolls is the most important indicator i.e. changes in stock prices on WSE are in line with the value of Nonfarm Payrolls irrespective to the value of other indicators in the Employment Report.

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