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Intraday Effect of News on Emerging European Forex Markets: An Event Study Analysis

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Abstract:
We analyze the impact of Eurozone/Germany and U.S. macroeconomic news announcements and the communication of the monetary policy settings of the ECB and the Fed on the forex markets of new EU members. We employ an Event Study Methodology to analyze intra-day data from 2011–2015. Our comprehensive analysis of the wide variety of macroeconomic information during the post-GFC period shows that: (i) macroeconomic announcements affect the value of the new-EU-country exchange rates, (ii) the origin of the announcements matters, (iii) the type of announcement also matters, (iv) different types of news (good, bad, or neutral) result in different reactions, (v) markets react not only after the news release but also before, (vi) when the U.S. dollar is a base currency the impact of the news is larger than in case of the euro, (vii) announcements on ECB monetary policy result in stronger effects than those of the Fed, and (viii) temporary inefficiencies are present on the new-EU-country forex markets.

Keywords: foreign exchange markets; intraday data; abnormal returns; event study; macroeconomic announcements; monetary policy settings; European Union; new EU members
JEL: C52, F31, F36, G15, P59

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1. Introduction and motivation

Information on real economic events entering the forex market competes heavily with the information generated within the forex market itself (Evans and Rime, 2011). Both types of information are quickly processed by the forex market, which is a sign of its high efficiency and competitiveness among other segments of financial markets (Evans, 2010; Duffuor et al., 2012). Despite this, developments in macroeconomic fundamentals are extensively evidenced to be quite important for exchange rate movements (Cavusoglu, 2011) and specifically macroeconomic news releases were shown to have produced about 15 percent of exchange rate variation (Fratzscher, 2006; Laakonen, 2007); further relevant evidence is reviewed in the literature review section below. The available evidence is mostly based on developed markets, limited sets of news, the pre-2008 crisis period, and (G)ARCH-type modeling approaches. Emerging markets, the post-crisis period, and other techniques are much less explored. In this paper we aim to address the above shortcomings and analyze how three currencies from new EU countries (the Czech crown, Polish zloty, and Hungarian forint) react to foreign macroeconomic news and changes of ECB and Fed monetary policy settings. We employ Event Study Methodology to accurately assess the impact of good/bad/neutral news, and cover the relevant post-crisis period of 2011–2015. Thus, our contribution fills a specific gap in the existing literature.

Our research is motivated by relevant questions arising with respect to the propagation of news in forex markets. Do specific news—in terms of both type and quality—exhibit a markedly different impact? Is the impact dependent on the base currency? What is the duration of the impact? Is the forex market efficient when new information arrives? Why is analyzing the impact of news on emerging European forex markets interesting and important in the first place?

First, the transfer of information across a forex market might be different because forex markets are different from the rest of the financial markets in several ways. The forex market is open 24 hours a day compared to stock markets, which are usually open only 8 hours a day. Some news is released before the stock market opens and some after it closes. Thanks to the longer opening hours, the effect of news can be captured properly only on the forex market. Second, the forex market is the most liquid financial market in the world. We exploit this property and employ high-frequency, intraday, one-minute data and avoid the problem of market microstructure noise that is typical for stocks with low liquidity. European emerging markets often have liquidity problems, however, by analyzing the forex market we avoid the liquidity problem and analyze the impact of news as well as market efficiency.

Third, although most of the research focuses on developed markets, evidence from emerging markets is limited and the evidence from emerging European forex markets is scarce. This is quite surprising because new EU markets are important for international portfolio diversification and related strategies.[1]

There is evidence demonstrating that foreign macroeconomic news announcements have a greater impact on emerging financial markets than domestic news. For instance, Andritzky et al. (2007) shows that domestic news has a limited impact on bond spreads in several emerging markets, whereas changes in U.S. interest rates exert a significant influence there. Similar evidence can be found in Büttner et al. (2012) and Balcilar et al. (2016). Further, Dimpfl (2011) shows that U.S. news announcements influence emerging markets as well as developed markets (i.e. the German stock market). Fedorova et al. (2014) demonstrate that Euro area macroeconomic news releases affect stock market volatility in the emerging markets of Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa (CIVETS) and to some extent, stock returns in CIVETS stock markets. These are intuitive results as the two largest world economies—the U.S. and the EU—play an important role with respect to emerging markets.[2]

Empirical data suggest a close economic connection of new EU markets with Eurozone and Germany. Hayo et al. (2010) show a deepening euro area influence on new EU countries over time and a corresponding reduction in the relative importance of U.S. shocks. Hanousek et al. (2009) show that there are substantial positive spillover effects from the German financial market (as represented by the DAX30) to the Czech market (as represented by the PX50).

Because of the links described above we hypothesize various effects of news on the new-EU-country forex market; see Section 4.4 for formal details. Therefore, we examine both Eurozone and U.S. macroeconomic announcements on these six currency pairs: CZK/EUR, PLN/EUR, HUF/EUR, CZK/USD, PLN/USD, HUF/USD. Macroeconomic data are a very important source of information not only for the actual state of real economies, but more

[1] According to Jotikasthira et al. (2012), new EU markets are important for the portfolio diversification of mutual and hedge funds domiciled mainly in developed markets. They show 270 active funds in the Czech Republic, 276 funds in Poland, and 295 funds in Hungary after the crisis. What is more important, these fund holdings account for 3.6% of float-adjusted market capitalization in the Czech Republic, 8.6% in Hungary and 4.7% in Poland; this is more than 2.6% average number of free-float market capitalization in 25 emerging markets examined by Jotikasthira et al. (2012)..

[2] Because of the above evidence we refrain from analyzing the impact of domestic economic reports on CEE currency pairs. Further, trading activity involving CEE currency pairs is much lower than the trading activity of the three examined CEE currencies with respect to the euro and the dollar. Similar to the case of the forex market, Büttner et al. (2012) show that the Czech stock market is relatively more affected by foreign news since the Copenhagen Summit in December 2002.

importantly for their future prospects. For this reason, we examine both traditional macroeconomic announcements such as GDP, Trade Balance, Industrial Production, Retail Sales, NFP, CPI, PPI, and Core Durable Goods orders and also forward-looking indicators on the economic climate and prospects such as the PMI, ZEW, and Ifo indices. Because the recent post-2008-crisis period is not covered well, we use data from 2011–2015.

In terms of technology, most of the related research employs a GARCH-type modeling approach. However, the vast amount of daily or even intraday data dwarf the relatively limited number of announcements and this disproportion makes this technique disadvantageous. In order to better isolate the effect of announcements and policy settings on exchange rates we employ an Event Study approach. The technique is more suitable for our enterprise because it enables targeting the effect of specific announcements over a precisely defined time interval. Event studies are capable of capturing the flow of the impact of information; therefore, they are used to study the impact of a specific event on the value of various financial assets. Systematically, nonzero abnormal security returns that persist after a particular type of event are inconsistent with market efficiency.

Our results contribute to the literature by providing a comprehensive account of how new information entering the emerging EU forex markets propagate during the post-GFC period. We show that (i) macroeconomic announcements affect the value of the exchange rates of the new EU countries, (ii) the origin of the announcements matters, (iii) the type of the announcement matters, (iv) different types of news (good, bad, or neutral) result in different reactions, (v) markets react not only after the news release, but also before, (vi) when the U.S. dollar is a base currency, the impact of news is larger than in the case of the euro, (vii) announcements on ECB monetary policy result in stronger effects than those of the Fed, and (viii) temporary inefficiencies are present on the forex markets of new EU countries.

The rest of the paper is organized as follows. We review the relevant literature in Section 2. The sources, description, and characteristics of the data are presented in Section 3. We introduce Event Study Methodology in full detail in Section 4, where we also formulate our testable hypotheses. Section 5 covers the empirical results. Brief conclusions are brought forth in Section 6.

2. Review of the related literature

To review the relevant literature, we divide it into two parts. First, we review the literature that assesses the impact of information on the forex market. Second, we discuss the literature from the perspective of the employed methodology.

The forex market works with a vast amount of information, and that information is both generated from within the market as well as flows into the market. Exchange rates, similar to other financial market instruments, are quite responsive to developments in the real economy that are channeled to the market via macroeconomic news releases; see Cavusoglu (2011) for a survey and Fratzscher (2006) and Laakonen (2007) for direct evidence.

Among macroeconomic announcements, those originating in large economies are hypothesized to be the most important ones. Faust et al. (2003), Andersen et al. (2003), and Chaboud et al. (2004) studied U.S. news releases. Ehrmann and Fratzscher (2005) examined U.S. and German news releases. More recent studies examining the effect of news include Neely (2011), Hafner and Omrane (2015), Cakan et al. (2015), and Gilbert et al. (2015). All these studies confirm that U.S. and European news releases exhibit significant effects on pricing on forex markets and on financial markets in general.

The evidence coming from developed economies is relatively rich. Emerging markets are much less explored, though. Literature analyzing the new EU markets based on an empirical exploration of intraday data is even scarcer despite the fact that these Central European markets are quite important from the perspective of international portfolio diversification. Hanousek et al. (2009) studied the reaction of asset prices to macroeconomic announcements in Hungary, the Czech Republic, and Poland using intraday data. They found that the Czech stock market is impacted more by U.S. macroeconomic announcements than by EU ones, while the opposite is true for the Hungarian and Polish stock markets. Continuing this line of research, Hanousek and Kočenda (2011) categorize EU and U.S. macroeconomic announcements into four general classes to study the impact on Czech, Hungarian, and Polish stocks for the period from 2004 to 2007. The authors' findings suggest that the Czech, Hungarian, and Polish stock markets have significant responses to EU macroeconomic news, but not to U.S. macroeconomic news. The results are clearly period-sensitive: Buttner et al. (2012) analyzed the same set of markets during 1999–2006 and find that the impact of EU news dominates the impact of U.S. news on all three markets.

The above evidence centers on stock markets. New-EU-country forex markets' responsiveness to incoming information are analyzed by Égert and Kočenda (2014), who also divide their analysis into the pre-crisis (2004–2007) and crisis (2008–2009) periods. They show that the Czech, Hungarian, and Polish currencies react to macroeconomic news during both periods in an intuitive manner corresponding to exchange rate-related theories. However, while before the crisis the number of macroeconomic news releases affects forex market reactions, during the crisis the relationships break down and the currencies react only to news

on the key economic indicator (real GDP growth). The responsiveness of the currencies to central bank verbal interventions follows a slightly different pattern: exchange rate-related verbal communications of central banks matter when markets experience high uncertainty (crisis), while during calmer days markets are less attentive.

In terms of methodology, the existing literature, including the examples above, examines the impact of macroeconomic news announcements on currency markets mostly by using GARCH-type models. In our analysis we employ Event Study Methodology and use intraday data. As pointed out by Gürkaynak and Wright (2013), the main identification assumption of high frequency (intraday) event studies is that the market quickly incorporates information from announcements into asset prices. This assumption, combined with the lumpiness and the knowledge of the precise timing of the announcement, allows the researcher to specify a narrow event window around the announcement times. As opposed to the GARCH modeling approach, this way it is possible to not only capture the full effect of the announcement, but also to eliminate contamination from other shocks to the economy.

Event Study Methodology was frequently applied to developed markets to study the impact of FOMC monetary policy settings and communications on financial markets. For example, Kearns and Manners (2006) investigated the impact of changes in monetary policy on the exchange rate in Australia, Canada, New Zealand, and the United Kingdom. Gürkaynak and Sack (2005) analyzed the effects of U.S. monetary policy on U.S. asset prices. Bredin et al. (2009) examined the impact of UK and German/Euro area monetary policy surprises on aggregate and industrial level stock returns represented by FTSE and DAX. They find that UK monetary policy surprises have a statistically significant impact on both the FTSE index and industry-level stock returns. Swanson (2011) compared the effects of Operation Twist and the QE program on the U.S. bond market. Leon and Sebestyen (2012) explained ECB monetary shocks in terms of the variation of interest rates. Moreover, Event Study Methodology was used to analyze the effects of Fed communications on emerging markets. Wongswan (2009) analyzed the impact of U.S. monetary policy announcement surprises on foreign equity indexes, short- and long-term interest rates, and exchange rates in 49 countries. Moore et al. (2013) estimated the impacts of U.S. LSAPs on emerging market economies' local currency bond markets. Rai and Suchanek (2014) estimate the impact of U.S. monetary policy on EME capital flows, exchange rates, stock markets, and bond yields. Mishra et al. (2014) analyzed the market reactions to the 2013–2014 Fed announcements related to the tapering off of asset purchases for 21 emerging markets.

Among the studies of emerging markets, Event Study Methodology was applied by Gurgul and Wójtowicz (2014), who analyzed the impact of U.S. macroeconomic news on the Polish stock market and found persuasive evidence of increases in abnormal returns following macro releases. Égert (2007) used Event Study Methodology to show that central bank interventions coupled with communications and backed by interest rate news exhibit quite a lasting effect on the exchange rate of the Czech, Hungarian, and Polish currencies. As for the emerging currency markets, Event Study Methodology was used to investigate the impact of central bank interventions. For example, Galati and Disyatat (2005) analyzed the effectiveness of foreign exchange intervention in the Czech Republic, Naidu (2011) studied India, Leon and Williams (2012) analyzed data from the Dominican Republic, and Menkhoff (2013) examined South America, Eastern Europe, and Asia. The literature examining the impact of macroeconomic news announcements on forex markets applying an Event Study methodology is scant or non-existent, though. Thus, from various angles our analysis fills existing gaps in the literature.

3. Data: sources, description and characteristics

We intentionally deviate from standard practice and introduce the data before outlining our methodology. The reason is that when we describe our use of Event Study Methodology in Section 4, we need to refer to some specific details related to announcement releases. Hence, the description of the data precedes that of the methodology.

3.1 Forex data

We use exchange rate data on three new EU currencies: the Czech koruna, Hungarian forint, and Polish zloty. The intraday one-minute exchange rates are taken from MetaQuotes corresponding to the CET time zone for the period beginning on January 3, 2011 and ending on December 31, 2015.

Under direct quoting, the spot exchange rate S_i ($x_i/1_j$) is expressed as the amount x of a currency i (quoting currency) that one needs in order to buy one unit of currency j (base or reference currency). In our case the CEE currencies are the quoting currencies and the euro and U.S. dollar are the base currencies. Hence, when we refer for example to the Czech koruna, we refer to its value defined as the number of korunas needed to buy one euro or one U.S. dollar. We transform our data into percentage returns: $r_t = \ln(R_{t+1}/ R_t)*100$. Thus, a negative change in an exchange rate means that the amount of the quoting currency i needed to buy one unit of currency j becomes smaller, which means an appreciation of the quoting

currency *i* with respect to the reference currency *j* (positive return). Similarly, a positive change represents a depreciation of the quoting currency (negative return).

In Figures 1–2 we present the dynamics of the exchange rates under research along with relevant comments. All three of the examined new EU countries use a free-floating exchange rate regime with independent central banks aiming for price stability. However, the Czech National Bank decided to use the exchange rate as a monetary policy instrument and have commenced foreign exchange interventions since November 7, 2013. Officially, the bank aims to use the exchange rate as a monetary policy instrument until mid-2017. The policy of the CNB is to prevent the excessive appreciation of the koruna below CZK 27/EUR. On the stronger side of the CZK 27/EUR level, the CNB is preventing the koruna from appreciating further by intervening on the foreign exchange market, i.e. by selling koruna and buying euro. On the weaker side of the CZK 27/EUR level, the CNB is allowing the koruna exchange rate to float. The big spike in CZK/EUR and CZK/USD daily returns shows the start of exchange rate interventions.

All three examined CEE currencies depreciated against the U.S. dollar during the examined time period (2011–2015). At the same time, the Czech crown and Hungarian forint weakened relative to the euro. Speaking of the Czech crown, part of its weakness was caused by currency interventions. Regarding the Hungarian forint, its weakness against the euro may be explained by the fact that the economy has still not fully recovered from damages caused by the financial crisis. On the contrary, the Polish zloty has been resilient to the euro and has kept its value, oscillating around 4.2. In general, the development in the years after the financial crisis is demonstrated to be more unenthusiastic for the currencies of developing countries than for the currencies of developed markets.

The volatility of the Czech koruna, proxied by the pattern of the returns, is the lowest among the new-EU-country currencies. The CNB intervention regime makes the koruna very stable against the euro after the introduction of a cap at 27 CZK/EUR in 2013. On the other hand, the volatility of the koruna's exchange rate against the USD rose after November 2013. The most volatile currency is the Hungarian forint. Generally, the exchange rates of the new-EU-country currencies with respect to the U.S. dollar are more volatile than those with respect to the euro.[3] This can be explained by the closer economic connection of the new EU

[3] In terms of market volatility, we acknowledge that the Chicago Board Options Exchange SPX Volatility Index (VIX) stayed at relatively low levels during the period under research. However, Barunik et al. (2016) show that connectedness on the forex market was high during 2008–2010, somewhat lower during 2011–2012, and then again increased during 2013–2015. This evidence means that while the overall market volatility might be

countries to Germany, or the EU in general, than to the U.S.A., especially with respect to international foreign trade and foreign direct investment. More than 25% of the new EU countries' exports goes to Germany alone. For this reason, we expect positive (negative) EU/Germany macroeconomic news announcements to positively (negatively) impact both the base and quoting currencies. As a consequence, the prices of both the base and quoting currencies are moving in the same direction, which results in lower volatility than the exchange rate of the new-EU-country currencies with respect to the U.S. dollar.

3.2 Macroeconomic announcements

We gathered data on macroeconomic announcements coming from the Eurozone/Germany and the U.S.A. An extensive data set on 22 different macroeconomic announcements (news) from both regions is divided into four main categories. The Eurozone/Germany data set contains announcements on (i) business climate (Markit's Purchasing Managers' Index (PMI) from the Manufacturing and Non-manufacturing sectors, the German Business Climate Index, and the German ZEW Economic Sentiment Index), (ii) the real economy (Industrial Production, GDP, Retail Sales, Trade Balance), (iii) prices (measured by CPI and PPI), and (iv) monetary-type indicators represented by central bank announcements of key interest rate changes and monetary policy settings.[4] In total we employ six German macroeconomic indicators (Ifo, ZEW, PMI indices from the Manufacturing and Non-manufacturing sectors, Industrial Production, GDP) and four indicators related to the Eurozone economy (CPI, PPI, Trade Balance, Retail Sales).[5]

The U.S. macroeconomic indicators are also divided into four categories. These are announcements on (i) business climate (Purchasing Managers' Index (PMI) from the Manufacturing and Non-manufacturing sectors provided by ISM), (ii) the real economy (Industrial Production, GDP, Retail Sales, Trade Balance, Core Durable Goods Orders, and

relatively low, there were substantial volatility spillovers among currencies on the forex market during most of the time covering the span of the current research.

[4] There are two versions of the CPI report released about two weeks apart: Flash and Final. We consider the Flash report, which is extremely early and therefore tends to have a significant impact. There are also two versions of the GDP report released approximately 10 days apart: preliminary and final. The preliminary release is the earliest and thus tends to have a larger impact. We examine the data for the preliminary GDP release.

[5] Germany's PMI indices are preferred to the Eurozone's because they are published 30 minutes earlier. We expect the primary market reaction to the data released first. German GDP is published three hours before the aggregate GDP from the Eurozone. For this reason, we expect the primary market reaction to be on Germany's data. As for the Ifo and ZEW indices, they do not have a composite Eurozone equivalent. Industrial Production is the key feature of the German economy. We prefer aggregate CPI and PPI from the Eurozone even if they are published a few days after the German indices, because they are the key indicators followed by ECB monetary policy. Even if Germany is the largest economy of the Eurozone, aggregate Retail Sales and Trade Balance published a few days after Germany may produce different results than only the German data.

Non-farm Payrolls), (iii) prices (measured by CPI and PPI), and (iv) monetary-type indicators represented by central bank announcements of key interest rate changes and monetary policy settings.[6]

The macroeconomic announcements used in this paper are reported by Reuters with a clearly defined calendar and timing of news releases. Reuters also contains the market expectations of specific news, the so-called consensus forecast of financial market analysts, which constitute a proxy for market expectations similar to the one used in Andersen et al. (2007) and by Égert and Kočenda (2014) in the context of the new EU markets.

The above arrangement is particularly important since it enables us to analyze the effect of news from the *excess impact* perspective. Because financial markets form expectations about scheduled important news, it is not the news itself that matters but its difference from what the market expects it to be (market consensus). Further, the reaction of financial markets to the surprise component of the news announcements in terms of market efficiency is also worth examining as the expected announcements have no effect on asset prices (Bernanke and Kuttner, 2005; Hausman and Wongswan, 2011). It is reasonable to hypothesize that the news deviation, or its excess impact, may then affect exchange rates. Formally, the excess impact news variable, or "surprise" as Andersen et al. (2007) call it, is labeled xn_{it} and defined as

$$xn_{it} = (sn_{it} - \mathrm{E}_{t-1}[sn_{it}]) / \sigma_i,$$

where sn_{it} stands for the value or extent of the scheduled announcement i at time t, $\mathrm{E}_{t-1}[sn_{it}]$ is the value of the announcement for time t expected by the market (market consensus) at time t-1, and σ_i is the sample standard deviation of announcement i. The standardization does not affect the properties of the coefficients' estimates as the sample standard deviation σ_i is constant for any announcement indicator i. This approach allows us to divide all releases to three clusters of surprise announcements: better than expected (good news), worse than expected (bad news) and in line with consensus (neutral news).

The link from the announcement type to its effect on financial assets is not always clear and depends on how market perceptions reflect specific macro-financial linkage. When the actual value of an announcement exceeds market expectations, existing studies show positive effects on stock prices for announcements associated with Industrial Production, GDP, Factory Orders, Retail Sales, Trade Balance, and all confidence and business climate indicators (Kim et al., 2004; Ramchander et al., 2008). Negative effects were observed for

[6] We prefer the NFP announcement to the unemployment rate number because Andersen et al. (2007) showed that Non-farm Payrolls is one of the most significant macroeconomic announcements.

prices (CPI and PPI), money, and interest rates (Ehrman and Fratzscher, 2004; Flannery and Protopapadakis, 2002; He, 2006; Jones et al., 2005; Rigobon and Sack, 2008, Thorbecke, 1997). The reaction of exchange rates might be less clear, though. First, while an exchange rate-based contract might be considered a single instrument, an announcement impacts the relative price of the two currencies. Hence, a currency contract is not a single asset like stocks or bonds. Second, under the prevailing economic conditions, an announcement considered good news in one country might not be the same in another country. For that reason, we refrain from forming overly specific expectations on the effects of announcements on abnormal exchange rate returns. However, in general, we can say that in case of the PMI Manufacturing index, the PMI Non-manufacturing index, the German Ifo Business Climate Index, the German ZEW Economic Sentiment Index, Retail Sales, Trade Balance, Core Durable Goods Orders, GDP, NFP, and Industrial Production an announcement above the consensus (good news) is expected to have a positive impact on the quoting currency, whereas CPI or PPI above the forecast (bad news) is expected to have a negative impact on the quoting currency. The same logic applies for the opposite surprises.

The time difference between the European and U.S. financial markets is accounted for by setting a homogenous CET time for all news releases so there is no time difference. All the announcements used in this paper are reported with a clearly defined date and time of the news release. Most of the U.S. announcements in this study are released at 8:30 a.m. EST (2:30 p.m. CET).[7] Only Industrial Production is released at 8:15 a.m. EST (2:15 p.m. CET) and PMI indices are published at 10:00 a.m. EST (4:00 p.m. CET). Daylight Savings Time is introduced in the U.S.A. two weeks earlier than in Europe in the spring and ends one week later in the fall. In these cases, the U.S. announcements are released one hour earlier, at 1:15 p.m., 1:30 p.m. and 3:00 p.m. CET, respectively.

All announcements are made monthly except for GDP, which is measured quarterly. The monthly frequency of the news announcement provides us with a sufficient number of observations. Moreover, monthly announcements deliver earlier information about the economy than data released on annual or quarterly basis. The sequence in which macroeconomic data are announced may play an important role in market reaction. As a result, indicators published at the beginning of the month may attract more investor attention and market reaction than those published at the end of the month (Andersson et al. 2009).

[7] EST is Eastern Standard Time and CET is Central European Time.

From this perspective, we can hypothesize that the business climate indicators might ignite the most significant reaction of the financial market. With respect to the U.S. macroeconomic news announcements, NFP and PMI are among the earliest indicators to be published each month. Retail Sales, CPI, and PPI are released in the middle of the month. Core Durable Goods Orders are announced at the end of the month, Trade Balance is released after the month ends and quarterly GDP is published one month after the respective quarter ends.

The first information about the German economy is provided by the business climate indicators (Purchasing Managers Indices, Ifo Business Climate Index, and ZEW Economic Sentiment Index). Later on, CPI, PPI, Retail Sales, Trade Balance, and Industrial Production are available. The last one released is GDP.

Even though macroeconomic indicators are announced on different days, it may happen that two or more indicators are released on the same day. This is the so-called confounding events problem. Therefore, if there are two or more macroeconomic announcements released on the same day and at the same time, they are considered only if they do not contain contradictory information, i.e. if they have the same hypothesized effect on the quoting currency. This procedure was also applied to announcements that were released within a 15-minute time frame, i.e. U.S. Industrial Production released at 2:15 p.m. CET and CPI and PPI published at 2:30 p.m. CET. In our analysis we have to solve the confounding events problem, but at a 90-minute time span. For example, NFP is released at 2:30 p.m. CET and the PMI index is released at 4 p.m. CET. Egert and Kočenda (2011) study the same set of countries and show that the crucial impact of the news entering the stock market does not last longer than five minutes after the release and the remaining effect vanishes fully after another 20 minutes. Based on this result, we assume that more than a half of the pre-event window is not influenced by the previous news announcement. For this reason, we treat a second announcement released later the same day as a separate event.

The confounding events problem we face differs for the U.S. and Europe. In the U.S., the problem is chiefly connected with CPI, PPI, and Industrial Production. Due to the fact that Industrial Production is always released 15 minutes before the price indices, we consider news on CPI and PPI only if they do not contain contradictory information, i.e. if all the announcements have the same effect on the quoting currency. All in all, there are only 39 out of 60 price announcements examined (CPI, PPI). The confounding event problem decreased the number of announcements of Retail Sales (47 events), Trade Balance (51 events), Core Durable Goods Orders (59 events), and Industrial Production (59 events). Next, we examine

NFP, the PMI Manufacturing index, and the PMI non-manufacturing index, all with 60 events (12 events a year within five years). GDP has 20 events (GDP is measured quarterly).

Concerning the European market, the first information about German economic health is provided by the leading indicators of the German economy (ZEW, Ifo, PMI). Later on, PPI, Retail Sales, Trade Balance, and Industrial Production are released 35 to 40 days after the month's end. The last released indicator is GDP. Examining the European and German macroeconomic data, we follow the same rules as with U.S. data if the confounding events problem occurs. If two events are released in the same hour, we consider them only if they do not contain contradictory information. In the case when two events are released on the same day but at a different time, we consider only the first one if there is less than a one-hour time span.

In the case of Europe, the confounding events problem does not allow us to examine all the macroeconomic announcements. Speaking of the German PMI indices, we analyze 32 out of 60 events, because PMI indices from the manufacturing and non-manufacturing sectors are usually released on the same date and hour. Speaking of the rest of the German/Eurozone macroeconomic events, we examine 57 ZEW Economic Sentiment Indices, 58 Ifo Business Climate Indices, 60 Industrial Productions, 55 Trade Balances, 59 Retail Sales, 58 PPIs and CPIs, and 20 GDPs. All details on the announcements are provided in Table A1 in the Appendix.

3.3 Monetary settings

We also analyze the effects of monetary policy decisions. We now provide a brief background of the monetary policy settings in the U.S. and Europe and describe the events we investigate.

In December 2009, with the financial crisis in full swing, the Federal Open Market Committee (FOMC) of the Fed had lowered the target for the federal funds rate to nearly zero. The unfamiliar monetary environment of the zero lower bound interest rate policy (ZIRP) lasted until December 2015. Applying the ZIRP is a method of stimulating economic growth, while keeping interest rates close to zero. Under this policy, the governing central bank can no longer reduce interest rates, rendering conventional monetary policy ineffective. As a result, unconventional monetary policy such as quantitative easing is used to increase the monetary base. We analyze the impact of six times when the Fed changed the monetary policy settings during the examined time period.

The main task of the European Central Bank (ECB) is to maintain price stability in the euro area and to preserve the purchasing power of the joint currency. The ECB targets CPI at

a rate close to but below two percent. ECB announcements inform investors about the decisions on interest rates. Following the U.S. financial crisis and the European debt crisis, the ECB gradually lowered all three main interest rates in the examined time period. We investigate the market reaction to the ECB rate announcements only on the days when at least one of the three main rates were changed. Furthermore, we look into two more ECB meetings. On January 22, 2015 there was no rate change, but the ECB announced the planned launch of the Quantitative Easing (QE) program at a press conference. This event took place after the rate announcement at 2:30 p.m. CET. Similarly, on March 5, 2015 the ECB introduced details of the QE program.

The list, content, timing, and other details of the monetary policy settings are presented in Table A2 in the Appendix. Because of the varied nature of Fed and ECB events, we quantify these events in the form of dummy variables with a precise time identification. Thus, the monetary policy setting dummy reflects key information arising at the market from each central bank. Because the number of such announcements is small, we set the dummy variable to be equal to one for each event and zero otherwise. In this way we do not distinguish the qualitative nature of central bank announcements. Rather, we aim to capture the potential effect of central bank announcements as well as the recognition of such announcements by the market.

4. Event Study Methodology Approach

We analyze the effects of macroeconomic announcements and policy settings on exchange rates using Event Study Methodology (ESM). ESM was introduced by Dolley (1933) to examine the price effects of stock splits. Ball and Brown (1968) and Fama et al. (1969) introduced the methodology that is used to the present day. Ball and Brown (1968) recognized the information content of earnings and Fama et al. (1969) removed the effects of dividend increase when studying the stock splits effect.

ESM is widely used in financial research because they are capable of capturing the flow of information into asset prices. Using financial market data, ESM measures the impact of a specific event on the value of a financial asset. Moreover, in capital market research ESM serves as an important vehicle to test market efficiency. Systematically nonzero abnormal security returns that persist after a particular type of event are inconsistent with market efficiency. We opt for ESM because of its precision in identifying the reaction of an asset

following each event. However, at the same time we acknowledge the wealth of research obtained via different methodologies.[8]

Depending on data and technology evolution, the method was first applied on monthly data, later on daily data, and then on intraday data. A data set based on a shorter time frame with higher frequency permits more precise measurement of abnormal returns and enables performing more informative studies of announcement effects. According to Kothari and Warner (2006), short-horizon methods are relatively straightforward and trouble-free. Therefore, more confidence and weight could be put on the results of short-horizon tests than long-horizon tests. According to Fama (1991), short-horizon tests represent the cleanest obtainable evidence on efficiency.

The initial task of conducting an event study is to define the event of interest and to identify the period over which an asset price will be examined. In this paper, the assets are currency prices (new-EU-country exchange rates) and the events are defined as the unexpected component of the macroeconomic news announcements and the central bank's monetary policy changes described in detail in the data section.

4.1 Abnormal returns

The assessment of an event's impact requires a measure of abnormal returns. Following Brown and Warner (1980), an abnormal return is the actual ex post return of the exchange rate over the event window minus the normal return of the exchange rate over the event window. The normal return is defined as the expected return without conditioning on the event taking place. Abnormal returns are defined as the difference between actual returns and their expected values. Hence, for the *i*th event and time *t* the abnormal return (AR_{it}) is defined formally as:

$$AR_{it} = r_{it} - E[r_{it}/x_{it}], \quad (1)$$

where r_{it} denotes the actual return and $E[r_{it}/x_{it}]$ denotes the expected return, given the conditioning information x_{it} for the expected return model. We formally define return r_{it} as

[8] The majority of studies examining the impact of macroeconomic news announcements and central bank monetary policy settings employ various types of (G)ARCH models in order to examine jointly the conditional volatility and market reaction. Examples assessing the issue on emerging European financial markets include Fišer and Horváth (2010), Egert and Kočenda (2007, 2011, 2014), Büttner and Hayo (2010), Buttner et al. (2012), Hanousek et al. (2009), and Hanousek and Kočenda (2011).

$$r_{it} = \ln(R_{t+1}/R_t)*100, \quad (2)$$

where r_{it} is the one-minute percentage return on the exchange rate and R_{t+1} and R_t denote the exchange rates one minute apart.

We follow the practice in the literature (MacKinlay, 1997; Kothari and Warner, 2006) and calculate expected returns based on a model estimated on the basis of the returns from the pre-event window, i.e. returns prior to the event window.[9] All computations are based on one-minute log-returns computed on the close prices.

When estimating the expected returns $E[r_{it}/x_{it}]$, we test the currencies' returns for autocorrelation and heteroscedasticity. As we do not find either autocorrelation or heteroscedasticity in the returns we employ a Constant Mean Returns Model (CMRM); an autoregressive model would be an alternative in case of detected autocorrelation. Hence, the expected returns are derived based on the following CMRM regression:

$$E[r_{it}/x_{it}] = \mu_i + \xi_{it}, \quad (3)$$

where μ_i is the mean return for asset *i* and ξ_{it} is the time period *t* disturbance term for event *i* with an expectation of zero ($E(\xi_{it}) = 0$) and variance var (ξ_i) = $\sigma_{\zeta i}^2$. Although the constant mean return model is perhaps the simplest model, Brown and Warner (1985) find that it often yields a result similar to those of more sophisticated models. This logic corresponds to MacKinlay (1997), who argues that the lack of sensitivity to a particular model is due to a very small reduction of the variance of the abnormal returns when a more sophisticated model is employed.

4.2 Pre-event and event windows

The key element of an event study is the appropriate choice of pre-event and event windows and typically the estimation window and the event window do not overlap (MacKinlay, 1997). It is customary to define the pre-event window as larger than the event window. We define the windows in the following way. First, similar to Gurgul and Wójtowicz (2014), we set the pre-event window at 130 minutes. That is more than two hours before the event

[9] The same approach has recently been adopted by Rahman et al. (2014) and Gurgul and Wójtowicz (2014).

occurs.[10] Second, we choose the event window to have a length of 26 minutes. The event window covers (i) exchange rate returns that occur five minutes before the event, (ii) returns at the time of the news announcement (labeled as the zero-minute period that lasts for one minute) and (iii) returns covering the 20 minutes after the macroeconomic news announcement. The choice of the event window's length is grounded in the following facts related to each segment of the event window. First, because investors and traders know the calendar of macroeconomic news announcements and form expectations about their values, abnormal returns related to each specific event may also occur in the pre-event period. Thus, the event window starts five minutes before the news announcement. Second, we consider 20 minutes after the news release to be a sufficiently long time for the news to be absorbed by the financial market because Egert and Kočenda (2011) show that new information entering the Czech, Hungarian, and Polish stock markets is largely absorbed by the markets within five minutes after the announcement and it is fully absorbed within 20 minutes.

To summarize the above description and to better illustrate the timing of the pre-event and event windows, we plot a time graph of the process in Figure 3. The pre-event window begins at t = -135 minutes and runs up to -6 minutes before the news announcement. The event window evolves from t = -5 to +20, that is from five minutes before to 20 minutes after the news announcement. The time when the news is released (t_0) is assigned as 0.

In order to illustrate the complexity of the event identification we face, we provide below details on the examined European macroeconomic news announcements that are not released at the same time. German GDP and German Industrial Production are released at 8:00 a.m. CET, PMIs are released at 9:30 a.m. CET, Ifo at 10:00 a.m. CET and ZEW, European CPI, PPI, Retail Sales, and Trade Balance all are released at 11:00 a.m. CET.[11] This means that the pre-event window contains returns from 5:45 a.m. to 7:54 a.m. CET (GDP and Industrial Production), from 7:15 a.m. to 9:24 a.m. CET (PMIs), from 7:45 a.m. to 9:54 a.m. CET (Ifo) and from 8:45 a.m. to 10:54 a.m. CET (ZEW, European CPI, PPI, Retail Sales, and Trade Balance). The event window contains returns from 7:55 a.m. to 8:20 a.m. CET, from 9:25 a.m. to 9:50 a.m. CET, and from 9:55 a.m. to 10:20 a.m. CET, respectively. Analyzing the foreign exchange market, which is open 24 hours a day, allows us to examine the effect of early morning data announcements such as GDP, when pre-event window calculation starts

[10] When estimating pre-event period parameters, the event period is generally not included. This procedure prevents the event itself from influencing the parameters obtained from the estimation of the normal performance model.

[11] German Industrial Production used to be released at 12:00 p.m. CET until March 2014. Afterwards, it was published at 8:00 a.m. CET.

from 5:45 a.m. CET. Therefore, FX market returns are free from highly volatile opening and closing sessions.

In a similar way, U.S. macroeconomic news are released from 2:15 p.m. to 4:00 p.m. CET. Most of the announcements come at 2:30 p.m. CET (NFP, Retail Sales, CPI, PPI, Trade Balance, Core Durable Goods Orders, and GDP), Industrial Production is released at 2:15 p.m. CET, and PMI indices come out at 4:00 p.m. CET. The pre-event window starts at 12:15 p.m. and finishes at 2:24 p.m. for data published at 2:30 p.m. CET. The event window runs from 2:25 p.m. to 2:50 p.m. CET. The pre-event window for Industrial Production is from 12:00 p.m. to 2:09 p.m. CET and for PMI from 1:45 p.m. to 3:54 p.m. CET. The event window is from 2:10 p.m. to 2:35 p.m. CET and from 3:55 p.m. to 4:20 p.m. CET, respectively.

4.3 Standardized abnormal returns

In practice, the increased volatility of abnormal returns is observed in the event window and to control for this phenomenon the standardized abnormal returns are used in the analysis instead of the estimated ones (Corrado, 2011; Corrado and Truong, 2008). For the pre-event and event windows, the standardized abnormal returns SAR_{it} are defined in the following way, which effectively accounts for a change in variance in abnormal returns:

$$\mathrm{SAR}_{it} = \mathrm{AR}_{it}/\mathrm{S}(\mathrm{AR}_i), \tag{4}$$

where

$$S(AR_i) = \sqrt{\frac{1}{129}\sum_{t=-135}^{-6} AR_{it}^2} \tag{5}$$

is the standard deviation of abnormal returns in the pre-event window. Further, the standardized abnormal returns are adjusted in the following way in order to control for the event-induced change in the cross-sectional variance:

$$SAR'_{it} = \begin{cases} SAR_{it} & t = -135, \dots, 0 \\ SAR_{it}/S(SAR_t) & t = 1, \dots, 20 \end{cases}, \tag{6}$$

where

$$S(SAR)_t = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(SAR_{it} - \overline{SAR}_{it})^2}. \tag{7}$$

S (SAR_t) is the cross-sectional standard deviation of standardized abnormal returns and *N* is the number of events in the cluster.

To test the statistical significance of mean abnormal returns in the event window, we employ the rank test of Corrado and Zivney (1992) with the correction of event-implied volatility by using SAR as described above. The two main advantages of this nonparametric test are that it does not need any assumption about the normality of abnormal returns and compared to other tests used in event studies, it has high power properties over other standardized tests (Corrado, 2011). Furthermore, the rank test of Corrado and Zivney (1992) based on the event period standardized returns has proven to be robust both against event-induced volatility (Campbell and Wasley, 1993) and to cross-correlation due to event day clustering (Kolari and Pynnönen, 2010).

We test the significance of abnormal returns for each t_0 in the event window separately. Thus for each t_0 = -5,…,20 the Corrado-Zivney T_{cz} statistics is defined as in Corrado (2011):

$$T_{CZ}(t_0) = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \frac{\left(rank(SAR'_{it0}) - \frac{n+1}{2}\right)}{\sqrt{n(n+1)/12}}, \quad (8)$$

where *n* is the length of the pre-event window (i.e. n = 130) and *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}. The distribution of T_{cz} statistics converges rapidly to the standard normal distribution as the number of events *N* increases.

The values of abnormal returns during pre-event and post-event windows are assessed in conjunction with their statistical significance and serve as the basis for the interpretation of our results, presented in the next section.

4.4 Testable hypotheses

Based on our research topic and given the event study methodology outlined above, we formulate the following testable hypotheses.

Hypothesis 1: Macroeconomic news announcements (for German/Eurozone and U.S. economies) do not affect the value of new-EU-country exchange rates.

Hypothesis 2: The origin of an announcement is irrelevant with respect to its effect on the value of quoting new-EU-country currencies.

Hypothesis 3: There is no difference among types of macroeconomic news announcements with respect to their effect on the value of new EU exchange rates.

Hypothesis 4: There is no difference in the qualitative direction of a news announcement (good, bad, or neutral) with respect to the effect on the value of new-EU-country exchange rates.

Hypothesis 5: There is no difference in the market reaction before and after the news announcement.

Hypothesis 6: The new-EU-country currency market is efficient. Generally, in an efficient market new public information is incorporated very quickly into asset prices. Therefore, the effect of news announcements is visible for a very short time.

Hypothesis 7: Announcements about ECB or Fed monetary policy settings do not affect the value of new-EU-country currencies.

5 Empirical Results

We present our results in a series of tables and figures. Because of the extensive amount of results, some of them are shown in the Appendix and only summarized in the text.

5.1 Aggregate perspective

We begin with assessing the impact of the German/Eurozone macroeconomic news announcements on exchange rates quoted with respect to the euro (CZK/EUR, PLN/EUR, HUF/EUR). Similarly, we assess the effect of U.S. macroeconomic news announcements on exchange rates quoted with respect to the U.S. dollar (CZK/USD, PLN/USD, HUF/USD). In Tables A3–A8 in the Appendix we present an aggregate assessment in which we do not distinguish between bad, good, or neutral news as we are interested in the total impact. For each macroeconomic news announcement and each minute of the event window we report the value of the mean abnormal return ($\overline{ARt}$), the value of the T_{cz} test statistic, and the corresponding *p*-value. The statistically significant impact of macroeconomic news announcements appears very rarely later than 15 minutes after the news release. Therefore, we report the results only up to 15 minutes after the news announcement. The number of events in each cluster is shown in parentheses, close to each announcement label.

The impact of the macroeconomic news release is characterized by the behavior of the mean abnormal returns. The findings in Tables A3–A8 in the Appendix show that all of the examined macroeconomic announcements are linked to significant abnormal returns over much of the event window. Moreover, the abnormal returns are often present also before the

announcements are officially released. These pre-announcement price drifts are important evidence that news does leak or are even traded before their official release; this behavior is not uncommon and documented for the U.S. announcements by Kurov et al. (2016). The biggest impact, in terms of the highest abnormal return, in euro-denominated currency pairs, occurs on the PMI indices, the Ifo index, and the GDP release. With respect to the U.S. dollar-denominated currency pairs, the highest abnormal returns are linked with the NFP and GDP releases.

The above results enable us to decisively reject null Hypothesis 1. Hence, we may state that macroeconomic news announcements on German/Eurozone and U.S. economies exhibit short-term effects in that they impact the value of the new-EU-country exchange rates. The exchange rates with respect to the U.S. dollar exhibit higher abnormal returns than the euro-denominated currency pairs; this finding is consistent with the behavior of the cumulative abnormal returns that we show later in Figure 5. The result may be explained by the sequence in which news is released. PMI and the Ifo index are among the first macroeconomic indicators released on the German economy and the same is true for the NFP in the U.S.A. Although GDP is the last-released indicator, the abnormal returns confirm its role as the most important indicator characterizing the overall state of the economy; this finding is in accord with a similar result from Égert and Kočenda (2014) during the crisis period.

5.2 Granular view

The above findings represent an aggregate picture; now we provide a more granular perspective. In the second step we divide the news into three clusters: good, bad, and neutral news as defined in Section 3.2. and present the results in Tables 1–6.[12] Similar to before, the impact of news announcements is represented by the mean abnormal returns in percent (columns labelled AR%). The columns labeled Tcz show the value of the Corrado and Ziveny (1992) test statistics. The numbers in parentheses close to the news labels denote the number of events. To save space we do not report the results for the whole event window t = (-5,…, 20), but only up to 15 minutes after the news release as later coefficients become insignificant. One interesting feature is that neutral news are often linked to quite high

[12] Good news is news with a value above the market consensus; bad news is below the market consensus; neutral news is in line with the market consensus. This logic applies to all macroeconomic announcements except for CPI and PPI, where good news is below the market consensus (i.e. lower than the expected inflation) and bad news is above the market consensus (i.e. higher than the expected inflation). There are no neutral news for PMI in the case of euro-denominated exchange rates.

abnormal returns. This finding might indicate that neutral news represent not only a lack of surprise but also the lowest uncertainty and potentially also the lowest losses. On the other hand, the lowest number of events can be detected in clusters of neutral news. This means that expectations of macroeconomic indicators do not often agree with the actual values that are released. Indirectly this feature tells us that analysts, whose expectations form the market consensus, are not very successful in predicting macroeconomic indicators. Rather, they are often "surprised" and thus provide us with more material to study in terms of events in categories of truly bad and good news.

The immediate reaction during the first couple of minutes after the news release can be observed in the case of CPI and PPI. The market reaction to the news on prices and their movements is intuitively correct and can be also understood based on the theory. A movement in prices affects the real interest rate and terms of trade and a movement in prices also affects the prices of forex options via interest rate parity. In both cases a movement in prices potentially strongly impacts the amount of money traded on the forex market.

The longest reaction in terms of significant abnormal returns after the news release can be traced to the announcements of PMI, Retail Sales, IFO, or Industrial Production. This finding indicates that news from the real economy does have important information value for the market. It also indirectly hints that transactions on the new-EU-country forex markets do reflect real economic activities despite that globally the majority of forex transactions are speculative in nature.[13]

Euro denominated exchange rates (CZK/EUR, PLN/EUR, HUF/EUR)

The occurrence of statistically significant abnormal returns right at the time of a news release ($t = 0$) is considerable, albeit not dominant (Tables 1–3). Rather, the exchange rates react to abnormal returns in the following minutes. The Hungarian forint (HUF/EUR) shows the largest number of statistically significant abnormal returns, which implies a less efficient market (Table 3). The strongest reaction of all of the new-EU-country currencies is exhibited for the ZEW index, the PMI index, the Ifo index, and GDP as the abnormal returns are further from zero (Tables 1–3). This finding might be related to the sequence in which

[13] The financial education website Investopedia states that "day-to-day corporate needs comprise only about 20% of the market volume. Fully 80% of trades in the currency market are speculative in nature" (http://www.investopedia.com/articles/forex/06/sevenfxfaqs.asp; retrieved on March 10, 2016). The data provided by the BIS (2013; p.6) do not provide a direct estimate of speculative trading but allow an indirect inference via foreign exchange market turnover by counterparty that is proportionally divided among non-financial customers (9%), reporting dealers (39%), and other financial institutions (53%). Further, in terms of the instruments, "FX swaps were the most actively traded instruments in April 2013, at $2.2 trillion per day, followed by spot trading at $2.0 trillion" (BIS, 2013; p.3).

macroeconomic indicators are released. Generally, the strongest reaction of the market is identified with neutral news. This may be explained by the fact that this cluster in most cases contains a small number of events. The highest significant abnormal return appears in HUF/EUR three minutes after a good German GDP data release (Table 3). ZEW, PMI, and Ifo are the first indices giving us new information about the economy. Bad news about industrial production is related to the longest statistically significant reaction for all new-EU-country currencies. With respect to the euro-denominated exchange rates, we can observe three key patterns (Tables 1–3): (i) the values of abnormal returns are smaller, (ii) the number of statistically significant abnormal returns is lower than with U.S. dollar-denominated exchange rates, and (iii) the statistically significant abnormal returns in the case of euro-denominated exchange rates appear immediately after the news announcements. We also see that larger abnormal returns are in general linked with good news then with bad news; this is consistent with the graphical presentation in Figure 5. In the case of bad news, there are significant abnormal returns even before the announcement of PMI, Retail Sales, and Trade Balance significant for CZK/EUR and HUF/EUR. Based on the results presented in Tables 1–3 we can reject null Hypothesis 5 as we firmly document that there is a difference in the market reaction before and after the news announcement.

U.S. dollar-denominated exchange rates

In the case of the U.S. dollar-denominated exchange rates, three key patterns emerge (Tables 4–6). First, the values of abnormal returns are larger. Second, statistically significant abnormal returns occur more often than in the case of euro-denominated exchange rates. The results show that the segment of the new-EU-country forex market where currencies are traded with respect to the U.S. dollar is less efficient than its euro-based counterpart. The results are also consistent with the graphical representation in Figure 5. Third, statistically significant abnormal returns occur much later, usually ten minutes after an announcement is released.

Some specific results further underline the above common patterns. The strongest reaction in terms of abnormal returns is related to NFP and GDP announcements. Again, NFP is one of the first news released at the beginning of each month, while GDP is a comprehensive number representing the state of the whole economy. NFP news is possibly leaked as the highest significant abnormal return emerges one minute before the (good) NFP

announcement is actually released.[14] As a contrast to the above, announcements of Industrial Production and Durable Goods Orders exhibit the weakest reaction in terms of the low values of the associated abnormal returns.

Finally, one minute before the news announcement there is a strong statistically significant reaction of all U.S. dollar-denominated exchange rates to the good news of the NFP, PMI Non-manufacturing index, Retail Sales, and Core Durable Goods Orders (Tables 4–6). The U.S. dollar-denominated exchange rates exhibit the smallest amount of statistically significant returns following the announcements of Industrial Production, CPI, PPI, and Trade Balance.

Based on the above evidence, we can reject null Hypothesis 3 that there is no difference among macroeconomic news announcements with respect to their effect on the value of new-EU-country exchange rates.

5.3 Size of abnormal returns

The impact of announcements presented in Tables 1–6 indicates the presence of asymmetric reactions. We verify this feature and establish its statistical background. First, we present the Box-and-Whisker plots of the mean abnormal returns (AR in %) in Figure 4. The plots show the distribution asymmetry of mean abnormal returns related to the three clusters of macroeconomic news announcements, i.e. good, bad, and neutral. The abnormal returns in the neutral cluster show the biggest dispersion. This may be explained either by the low number of observations in the cluster or by indecisiveness of investors whether neutral news is actually positive or negative for the quoting currency. The mean abnormal returns of the new-EU-country currencies denominated in USD reach higher absolute values than the new-EU-country currencies denominated in euro. As a result, we may say that the forex segment trading new-EU-country currencies denominated in the U.S. dollar is less efficient than that with new-EU-country currencies denominated in euro.

The above evidence that mean abnormal returns are not normally distributed is only indicative, though. To properly answer the question whether there are differences in the reaction of new-EU-country currencies to good, bad, or neutral news, we employ a nonparametric Kruskal-Wallis (KW) test. We compare the reaction of new EU foreign exchange rates after the individual news announcements classified into appropriate clusters of good, bad, or neutral news during the first minute (t_0) after the news announcement. As an

[14] We consider only good and bad news clusters because there is a low number of observations of neutral news.

alternative we also perform the same test for the first five minutes in order to account for the cumulative market reaction over a longer period of five minutes. From the results in Tables 1–3 we can see that significant market reactions in the euro-denominated exchange rates do not always appear in the first minute after the news announcement, but they often materialize later on.

The results in Table 7 show that in the case of euro-denominated exchange rates abnormal returns react significantly differently to good news of the ZEW index (one minute) and Retail Sales (one and five minutes), to bad news of the ZEW index (five minutes) and Ifo index (one minute), and to neutral news on the CPI (one and five minutes). Hence, in the above cases the hypothesis of equal distribution can be rejected and the Kruskal-Wallis test provides us with some evidence on the asymmetric perception of the quality of information irrespective of its value. However, more often we do not find evidence that the reaction is asymmetric. For the U.S. dollar-denominated exchange rates the results of the test show no asymmetry in the distribution of abnormal returns for any type of news.

To summarize, only euro-denominated exchange rates react significantly differently to some announcements. The dominant pattern is that exchange rates do not react differently to news, though. The above results are intriguing. Usually, negative news has a larger impact on the financial market (Andersen et al., 2007). Thus, our finding goes against common knowledge.

5.4 Duration of abnormal returns

An examination of post-event returns provides us with information on market efficiency. Systematically nonzero abnormal returns following an event are inconsistent with market efficiency and imply a profitable trading rule (ignoring trading costs). Therefore, the speed of market adjustment to the information revealed at the time of the event is an empirical question. We test the market efficiency hypothesis by applying the cumulative average residual method (CAR). CAR uses the sum of each minute's average abnormal returns $\overline{(ARt)}$. CAR starting at time t_1 through time t_2 (event window) is defined as:

$$\text{CAR}\,(t_1, t_2) = \sum_{t=t1}^{t2} ARt, \qquad (9)$$

where t_1 is equal to -5 (5 minutes before the news release) and t_2 equals 20 (the last minute of the event window).

The aggregation of mean abnormal returns through time provides us with information about the overall influence of the event of interest on the new-EU-country currency market. Moreover, CAR describes the duration and strength of each news cluster (good, bad, and neutral) on euro- or U.S. dollar-denominated new-EU-country currencies in the first 20 minutes after the news announcement, as well as shortly before news is actually released (Figure 5). The left and right portions of Figure 5 depict CAR for euro- and U.S. dollar-denominated exchange rates, respectively. To make the comparison of individual currency reactions more readable, we multiply the cumulative mean abnormal returns by -100. This adjustment enables quantifying the increase in an exchange rate's value on the vertical axis (CAR %), which indicates the appreciation of individual new-EU-country currencies in percentage points after the news announcement and vice versa.

A visual inspection of Figure 5 shows a substantial effect of macroeconomic announcements on new-EU-country currencies. However, important asymmetries can be detected with respect to both base currencies. Good German/Eurozone macroeconomic news leads to new EU (quoting) currency appreciation with respect to the euro (base currency). This does not mean that the euro depreciates after good news is released. Rather, the CAR evidences a stronger reaction of the new-EU-country currencies to good news from Germany/the Eurozone. Similarly, neutral news that is in line with market consensus leads to new-EU-country (quoting) currency appreciation as well. In a sense, we might say that the finding resonates well with the common notion that "no news is good news". On the contrary, bad news leads towards a depreciation of the new-EU-country currencies with respect to the euro.

The U.S. dollar-denominated exchange rates offer a different picture, though. Good U.S. macroeconomic news leads to U.S. dollar (base currency) appreciation and local new-EU-country (quoting) currency depreciation; the opposite pattern is linked to bad news. This discrepancy in the reaction, when compared to the euro-denominated exchange rates, can be reasonably explained, though. Earlier we stressed the importance of economic links between the new EU countries and the Eurozone and specifically Germany. Hence, there is a strong reaction of the new-EU-country currencies to the German/Eurozone news. On the other hand, the economic links of the new EU countries with the U.S. are less strong. Hence, when U.S.-originating good news is released, both the U.S. dollar and other currencies react. It is no surprise that the reaction of the U.S. dollar should be stronger than the reaction of any new-EU-country currency. Therefore, a depreciation of a new-EU-country currency following good U.S. news simply means that the reaction of the currency is weaker than the reaction of

the U.S. dollar itself. The reaction to neutral news is mixed. Finally, note that the reaction of the U.S. dollar-denominated exchange rates is greater than those linked to the euro. This is clearly visible as the scales of both portions of Figure 5 are not the same.

The CAR analysis provides an aggregate assessment and shows the pattern of the market reaction. The cumulative abnormal returns of the euro-denominated exchange rates reach lower values with a maximum of 0.2% and a minimum of -0.2% during the first 20 minutes after the news release, while those linked to the U.S. dollar reach three times higher values with a maximum slightly above 0.6% and a minimum slightly below 0.4%. This means that the overall impact of macroeconomic news announcements is stronger for the U.S. pairs than the euro pairs. The above results allow us to reject the null Hypothesis 2. Hence, there are considerable differences in the size of the news effect on the value of the new-EU-country currencies with respect to the origin of the news. The above results also mean that the forex market segment with new-EU-country currencies denominated in U.S. dollars is less efficient than those related to the euro.

The reaction of the U.S.-denominated new-EU-country currencies to bad news is 50 percent stronger than the reaction to good news. The CARs of U.S.-denominated new EU exchange rates reach 0.6% after bad news and minus 0.4% following good news. Moreover, the reaction of the market to bad news lasts longer. It takes twice more time till the CAR curve gets flat. Conversely, euro-denominated new-EU-country currencies show a heavier reaction to good news when it comes to CZK/EUR and PLN/EUR. This does not hold for HUF/EUR, where CAR for bad news reaches higher values than for good news, especially from the 11th minute after the news announcement. The null Hypothesis 4 about new-EU-country currencies' equal reaction to all types of news (good, bad, and neutral) is rejected.

Concerning the duration of the news announcement effect, it is obvious that mean abnormal returns appear on the market even before the news is released. Generally speaking, CAR starts to move two minutes before the announcement. The strong immediate market reaction takes place two minutes after the announcement for good news and approximately five minutes for bad news. This does not hold for PLN/EUR, which reacts indifferently to bad news. Following the results above and in Figure 5 we can see that new public information is not quickly incorporated into the currency prices so we can reject null Hypothesis 6 that the new-EU-country forex market is efficient.

5.5 ECB and Fed communication on their monetary policy settings

Finally, we examine the reaction of the new-EU-country currencies to changes in the Eurozone and U.S. monetary policy settings. We analyze these reactions during the post-crisis period (2011–2015) characterized by the fact that conventional monetary policy tools were unable to adequately respond to the economic situation. Many central banks had to find new ways of using the tools at their disposal to stimulate economic activity in the face of the prolonged downturn and sluggish recovery. One way of doing so was, and for many central banks continues to be, further asset purchases on the central bank's account with the policy interest rate already at (or near) the zero bound.

We examine the forex market reaction when the ECB or the Fed announced changes in their monetary policy settings mostly related to monetary expansion (see Table A2 in the Appendix for details). The quantitative results are shown in Table 8: all three currencies react to steps taken by the two key central banks in a remarkably different manner.

The Czech koruna reacted immediately after the ECB loosened monetary policy conditions. The CZK/EUR exchange rate exhibits the strongest reaction among the euro-denominated exchange rates as the abnormal returns are statistically significant immediately after the news release. The forceful and quick reaction of CZK/EUR is, however, complicated with alternating signs of abnormal returns. Such an undetermined direction of movement may be explained by the CNB currency interventions and its presence on the currency market as, on the stronger side of the CZK 27/EUR level, the CNB is preventing the koruna from further appreciation by intervening on the foreign exchange market. Mean abnormal returns of PLN/CZK is most consistent in the direction of the currency reaction, even though significant abnormal returns appear only five minutes after information release. The result shows that easier monetary conditions in the Eurozone led to the depreciation of the Polish currency and euro appreciation. The reaction of HUF/EUR is the quietest and also prior to the ECB policy announcement.

The impact of U.S. monetary policy changes on the new-EU-country currencies is present but is less significant than that of the ECB monetary policy.[15] Both PLN/USD and

[15] We acknowledge that the more significant impact of ECB monetary policy settings in comparison with Fed statements might be also due to the time during the day when reports are published. ECB reports are published at 1:45 pm CET (7:45 am EST) followed by a press conference at 2:30 pm CET (8:30 am EST). This means that the ECB policy reports are published during the period of highest market activity when the UK and U.S. forex trading sessions overlap. Conversely, the Fed's statements are always published at 2:00 pm EST (8:00 pm CET) followed by a press conference at 2:30 pm EST (8:30 pm CET), i.e. during the U.S. trading session when many traders in Europe are no longer active in the markets. On the other hand, 24-hour trading on the forex market does allow for the policy announcements to affect exchange rates around the clock. Furthermore, the examined CEE currencies paired with the euro reach, in general, higher cumulative abnormal returns after macroeconomic

HUF/USD depreciate after the Fed eases monetary policy. Negative abnormal returns appear in the first minute after the news release and depreciation reaches 0.024% (PLN) and 0.49% (HUF). There is no statistically significant impact on CZK/USD, though.

Based on the above findings we can reject the null Hypothesis 7 because we provide evidence that the ECB and Fed monetary policy changes do affect short-term changes in the value of the new EU currencies.

5. Conclusions

In this paper we analyze the impact of specific information entering the forex market on the currencies of new EU members (Czech koruna, Hungarian forint, and Polish zloty); the exchange rates are denominated in the euro and the U.S. dollar. The information covered includes Eurozone/Germany and U.S. macroeconomic news announcements, and communication on the monetary policy settings of the ECB and the Fed. In our analysis we fully exploit the wealth of intraday data and cover a relatively long period after the global financial crisis (2011–2015). As a tool we use Event Study Methodology (ESM) because of its precision to identify the reaction of an asset following each event, i.e. a macroeconomic announcement or policy setting communication. The impact of the events is characterized by the behavior of the mean abnormal returns. Hence, by using ESM we are also able to assess temporary forex market inefficiencies.

The results of our analysis can be summarized as follows. The biggest impact, in terms of the highest abnormal return, in euro-denominated currency pairs, occurs on PMI indices, the Ifo index, and the GDP release. With respect to the U.S. dollar-denominated currency pairs, the highest abnormal returns are linked with the NFP and GDP releases. The longest reaction in terms of significant abnormal returns after the news release can be traced to announcements of the PMI, Retail Sales, IFO, or Industrial Production. The exchange rates with respect to the U.S. dollar exhibit higher abnormal returns than euro-denominated currency pairs.

We distinguish the surprise element in the announcements by dividing the news into three clusters—good, bad, and neutral news—which are defined by the difference between the announcement and its expectation. Larger abnormal returns after Eurozone/Germany news announcements are in general linked with good news. Conversely, in the case of U.S. dollar-denominated exchange rates, larger abnormal returns are linked to bad news. The results also

news announcements from the Eurozone than the CEE currencies paired with the USD after U.S. macroeconomic news announcements (see Figure 5).

show that the values of statistically significant abnormal returns of the euro-denominated exchange rates are smaller, occur less often, and last for a shorter time than for U.S. dollar-denominated exchange rates. Finally, the segment of the new EU forex market, where currencies are traded with respect to the euro is more efficient than its U.S. dollar-based counterpart.

Communications on the monetary policy settings show that the ECB communication matters. The CZK/EUR exchange rate exhibits the strongest and HUF/EUR the quietest reaction among euro-denominated exchange rates. The impact of Fed monetary policy changes on the new-EU-country currencies is present but is less significant than that of the ECB: both PLN/USD and HUF/USD depreciate after the Fed eases monetary policy but there is no statistically significant impact on the CZK/USD exchange rate.

Our analysis is the first of its kind, providing a comprehensive analysis of the reaction of selected new EU forex markets to a wide array of macroeconomic information during the post-GFC period. We show strong and specific reactions along with temporary inefficiencies present on these forex markets.

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Table 1: Effect of Macroeconomic Announcements on Abnormal Returns of CZK/EUR

A: Good News

Time	ZEW (24)			PMI (13)			IFO (31)			Ind. Prod. (24)			GDP (9)			Retail Sales (23)			Trade Bal. (23)			CPI (21)			PPI (24)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	-0,002	a	2,67	0,009	c	1,84	0,002		1,58	-0,003		1,32	0,001		1,02	-0,001	c	1,70	0,000		0,64	0,000	b	2,57	0,001		0,52
-4	0,001		1,43	-0,007	a	2,90	0,002		1,52	-0,001	a	2,76	0,000		0,37	0,004	b	2,16	0,002		0,50	0,002		0,02	0,002	c	1,85
-3	0,002		1,35	0,005		0,42	0,001	b	1,99	0,004		1,45	0,001		0,02	-0,001	c	1,93	-0,003	a	3,12	0,000		1,26	0,000	c	1,72
-2	0,001		1,05	0,005		0,46	-0,004	a	3,45	0,007		0,96	-0,005	b	2,29	-0,004		1,52	-0,001	c	1,70	-0,001	c	1,78	0,003	b	2,29
-1	0,011		-1,39	0,007		-1,15	0,008		-1,32	0,001		1,25	0,000		1,05	0,001	c	1,74	-0,003	c	1,69	0,000	b	2,20	-0,001	c	1,88
0	0,000	b	2,20	0,000		0,60	0,004	b	2,18	0,002		1,23	0,002		0,98	0,004		-0,66	-0,002	b	2,55	0,000	b	2,43	0,000	b	2,42
1	0,001		-0,28	0,012		-0,14	0,011		-0,69	0,000		1,20	-0,004	a	2,70	0,004		1,39	-0,005	a	3,58	-0,002	a	3,25	0,004		0,63
2	-0,001		1,32	0,015		0,81	0,002		0,81	0,003	a	2,82	0,007		-0,70	-0,002	b	2,42	-0,002		0,56	0,001		0,77	0,000		1,62
3	0,002	a	2,78	-0,002	b	2,35	0,001	a	2,78	-0,001	c	1,95	0,001	b	2,44	0,000		0,48	0,001		0,84	0,001		-0,13	-0,005	a	3,78
4	-0,002		0,83	0,000	c	1,93	0,008		0,53	-0,003	a	3,79	-0,003	a	4,18	0,006		-0,45	0,001	b	1,97	-0,005	a	4,20	0,000		1,36
5	0,001	a	3,29	0,004	a	3,19	-0,005	a	3,91	0,003		-1,13	0,001		1,28	-0,003	a	3,40	0,002	b	2,12	0,004		0,51	-0,001		1,31
6	0,000		1,45	-0,006	b	2,39	-0,001	a	4,36	0,002	b	2,11	0,001		-2,27	-0,001		1,12	0,001	a	2,60	0,000	b	2,55	0,001		0,45
7	-0,003	a	2,91	0,003	b	2,57	0,000	a	2,98	0,001	c	1,81	-0,001	c	1,81	0,001	c	1,92	0,002		1,49	0,001	a	2,70	0,005		0,70
8	-0,003		1,49	0,000		0,70	0,008		-0,51	-0,004	b	2,41	-0,002	a	3,12	0,002		-0,23	-0,006	a	3,29	0,001		1,34	0,001	a	3,90
9	0,004		-0,55	0,000		1,06	0,003		1,55	0,002		0,59	-0,001	b	2,30	0,002	a	2,79	0,008		-2,93	0,000		0,84	0,002	c	1,69
10	-0,001	c	1,76	0,005		1,03	0,005	b	2,10	0,000	a	2,84	-0,006		0,56	0,001	b	2,39	0,000		1,54	0,001		-0,44	0,001		-0,76
11	0,000		0,80	-0,003	b	2,13	0,001		0,48	0,000	b	2,21	-0,001	c	1,80	0,004		1,45	0,001		0,45	-0,003	a	3,28	-0,001		1,02
12	0,004		-0,78	-0,003	b	2,55	-0,004	a	2,58	0,003		0,92	0,000	b	2,05	0,001	a	3,63	0,000		0,82	0,001		-1,15	0,000		1,59
13	-0,001		1,12	-0,004	a	3,29	0,000		1,30	0,001		0,85	0,000	b	2,05	-0,001		1,57	-0,003	a	2,98	0,000	a	3,41	-0,003	b	2,47
14	-0,002	a	3,80	0,002		1,12	0,004	b	2,34	0,000	a	2,89	0,003	b	2,44	-0,002	a	4,16	0,000		0,90	-0,004		1,34	0,002		0,73
15	-0,001		1,13	0,008		0,83	0,000	a	2,58	0,004		1,22	-0,001		1,29	0,002	c	1,73	-0,002	c	1,80	0,001		-0,32	0,001		1,41

B: Bad News

Time	ZEW (32)			PMI (19)			IFO (26)			Ind. Prod. (33)			GDP (7)			Retail Sales (29)			Trade Bal. (30)			CPI (21)			PPI (24)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,002		1,45	0,001	b	1,98	0,003		0,54	-0,002	c	1,92	0,003		-0,91	-0,001		1,64	-0,001		0,80	0,000	b	2,57	0,001		0,52
-4	0,003		0,68	-0,002	c	1,85	0,000	a	2,86	-0,002	a	3,80	-0,007	a	3,27	0,000	c	1,96	0,004	b	2,07	0,002		0,02	0,002	c	1,85
-3	-0,004	a	4,51	-0,005	b	2,25	-0,003	a	4,16	0,002		0,12	0,001		0,80	0,003		0,45	-0,001	b	1,98	0,000		1,26	0,000	c	1,72
-2	0,001		1,41	-0,004	a	2,96	0,001		0,14	-0,001	b	2,53	0,006		-1,04	-0,003	a	3,12	0,001	b	2,07	-0,001	c	1,78	0,003	b	2,29
-1	-0,007	a	4,03	-0,002	b	2,07	-0,002	c	1,74	-0,004	a	3,23	-0,015	a	4,44	-0,002	a	3,43	-0,002	b	2,40	0,000	b	2,20	-0,001	c	1,88
0	-0,001		1,63	-0,019	a	3,19	-0,001	a	2,58	-0,002	c	1,91	-0,006	c	1,80	0,001		1,20	0,002	c	1,71	0,000	b	2,43	0,000	b	2,42
1	0,002		0,75	0,004		0,82	0,000	c	1,81	-0,002	a	2,74	-0,005	b	2,27	0,000	a	3,55	-0,005	c	1,69	-0,002	a	3,25	0,004		0,63
2	0,000		1,27	-0,006	a	3,97	0,000	c	1,86	-0,001	a	4,04	0,002	b	2,01	0,003		0,99	-0,005		0,19	0,001		0,77	0,000		1,62
3	-0,004	a	5,94	-0,005	a	2,94	0,006		1,14	-0,002	a	3,56	-0,006		0,07	0,004		0,16	-0,002	b	2,06	0,001		-0,13	-0,005	a	3,78
4	-0,001		0,87	-0,003	b	2,54	-0,001	b	2,45	0,000	a	3,08	-0,004		1,02	0,002		-0,16	-0,001	a	3,83	-0,005	a	4,20	0,000		1,36
5	0,001	a	3,08	-0,003	a	4,55	0,000	a	2,87	0,000		0,72	0,004		1,30	-0,004	a	4,34	0,002	a	2,58	0,004		0,51	-0,001		1,31
6	0,003		-0,36	-0,001		0,08	0,001	b	2,50	-0,007	a	4,94	0,001		-0,45	0,000		1,60	0,000	a	3,16	0,000	b	2,55	0,001		0,45
7	0,004		0,60	0,000	c	1,81	0,001	a	3,33	0,001	a	4,31	-0,002		1,04	-0,002	a	2,83	0,001	a	3,08	0,001	a	2,70	0,005		0,70
8	0,002		1,60	-0,002		0,35	0,002		0,97	0,004		-1,34	0,002		0,74	0,005		-0,46	-0,001	a	3,47	0,001		1,34	0,001	a	3,90
9	0,001		0,42	-0,002	b	2,31	0,003		1,53	0,000		0,99	-0,004	a	2,59	-0,001	a	2,79	-0,002		0,98	0,000		0,84	0,002	c	1,69
10	0,003		0,27	-0,004	b	2,48	-0,002	a	4,51	-0,003	a	4,21	0,006		-0,11	-0,002	a	3,53	0,002		-1,25	0,001		-0,44	0,001		-0,76
11	0,003		-1,14	-0,008	a	4,35	-0,001	b	2,43	0,002		0,09	-0,003		1,54	0,000	a	3,20	0,001		-0,43	-0,003	a	3,28	-0,001		1,02
12	0,001		0,20	-0,003	a	3,79	-0,001	b	1,97	0,003		-0,57	-0,005		1,64	-0,002	a	3,87	0,006		0,25	0,001		-1,15	0,000		1,59
13	0,003		0,25	0,002	b	2,46	0,002		0,13	-0,004	a	4,04	0,002		0,95	-0,003	a	3,53	0,003		0,56	0,000	a	3,41	-0,003	b	2,47
14	0,000	a	2,99	-0,002	b	2,24	0,003		1,11	0,001	a	2,65	0,005		1,51	0,002		-0,01	0,002		0,66	-0,004		1,34	0,002		0,73
15	-0,002		0,96	-0,002	b	2,40	0,003	c	1,85	-0,002	a	4,99	0,005	b	2,09	-0,001	a	3,32	0,002		-1,22	0,001		-0,32	0,001		1,41

C: Neutral News

Time	ZEW (1)			IFO (1)			Ind. Prod. (3)			GDP (4)			Retail Sales (7)			Trade Bal. (2)			CPI (19)			PPI (14)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,007		-1,02	0,008		-0,84	0,011		-2,38	-0,007	a	3,28	-0,003		1,05	0,000		0,54	0,000		0,72	-0,002	c	1,74
-4	-0,015	b	2,19	-0,010		1,53	-0,012	a	2,78	0,007		-1,67	0,002		1,17	0,000		0,54	-0,003	b	2,09	0,000	b	2,10
-3	-0,037	b	2,38	0,000		0,15	0,009		-2,21	0,002		-0,36	-0,003	b	2,15	-0,008		1,56	0,000		0,93	0,002		0,32
-2	-0,007		1,58	0,008		-0,81	0,004		1,56	0,005		0,43	0,007		0,33	0,000		0,54	0,014		1,33	-0,007		0,86
-1	0,026		-1,66	-0,014	c	1,90	0,010		-1,93	-0,005	b	2,48	0,006		-1,00	0,004		0,81	-0,008		1,45	-0,002	c	1,66
0	0,007		-1,00	-0,007		1,08	0,001		1,25	0,001		0,38	0,000		0,83	-0,002		1,43	-0,001	a	2,62	-0,003	a	3,94
1	-0,004		0,94	-0,007		1,05	-0,001		0,31	0,016		0,21	0,004		0,74	0,002		-1,03	-0,003	a	3,86	0,002	b	2,22
2	-0,011	c	1,84	0,015		-1,42	0,002		0,19	-0,001	b	2,08	0,012		-1,29	0,000		-0,53	-0,001		0,81	-0,001		1,36
3	-0,007	c	1,82	0,004		-0,28	0,000	b	2,11	0,007		0,93	0,004		-0,25	-0,002		1,39	0,001		0,26	-0,014	a	3,60
4	0,004		-0,17	-0,018	b	2,11	0,000		-0,24	0,002		0,24	0,002		0,08	0,000	c	1,65	0,005		0,56	0,002		0,35
5	0,015		-1,55	0,047		-1,53	0,011		-1,65	-0,004	b	2,20	0,003		-0,39	0,000	c	1,75	-0,003	b	2,24	-0,001		-0,16
6	-0,007		1,53	0,000		0,57	0,003		0,07	0,002		-0,31	-0,001		0,13	0,004		-0,43	-0,005	b	2,32	-0,001		0,52
7	0,004		-0,94	0,000		0,60	-0,009	a	3,12	0,005		-0,09	0,006		-0,85	0,002		0,66	-0,003	a	3,22	0,002	c	1,65
8	0,018		-1,47	0,000		0,54	0,001		-0,64	-0,005	b	2,26	0,006		-0,54	0,002		0,90	-0,002	a	2,87	0,000	a	2,82
9	-0,007		1,47	-0,010		1,50	0,000		0,08	-0,003		1,04	-0,001	a	2,77	0,002		-0,26	-0,001		-0,64	0,001	b	2,12
10	0,000		-0,09	-0,021	b	2,08	0,001		1,17	0,002		0,42	-0,002		0,41	0,002		-1,14	0,000		0,26	0,001		0,02
11	-0,004		0,92	0,033		-1,69	0,004		-1,63	-0,003		1,45	0,002		0,76	0,000		-0,66	0,001		0,09	0,001		-0,48
12	0,000		-0,12	0,000		-0,25	0,010		-1,71	0,004		0,54	-0,001	c	1,83	0,000		-0,62	-0,001	b	2,20	0,000		-0,28
13	-0,007		1,55	-0,014	b	2,24	0,001		-1,48	-0,001		1,53	-0,002	b	2,06	-0,002		1,31	0,001	b	2,09	-0,005	a	3,80
14	0,004		-0,97	0,000		0,65	-0,005	a	2,84	0,000		-0,04	0,003		0,52	0,000		-0,69	0,004		-1,59	-0,001	c	1,65
15	-0,007		1,50	0,000		0,62	-0,008		1,42	0,000		1,35	0,000		1,59	0,002		-0,98	0,002		0,44	-0,001	a	3,56

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: ZEW – German Economic Sentiment Index, PMI – Purchasing Managers' Index, IFO – German Business Climate Index, Ind. Prod. – industrial production, GDP – gross domestic product, Retail Sales, Trade Bal. – trade balance, CPI – consumer price index, PPI – producer price index. Due to the absence of neutral news for PMI, the abnormal returns are not reported. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 2: Effect of Macroeconomic Announcements on Abnormal Returns of PLN/EUR

A: Good News

Time	ZEW (24)			PMI (13)			IFO (31)			Ind. Prod. (24)			GDP (9)			Retail Sales (23)			Trade Bal. (23)			CPI (21)			PPI (24)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	-0,003	c	1,65	0,012		-2,10	-0,001	c	1,70	0,001		1,11	0,002		-0,35	0,000		1,64	-0,001	c	1,90	-0,001	a	2,74	-0,003	a	2,76
-4	0,001		0,85	-0,001		0,83	-0,002	a	2,68	-0,001	b	2,00	-0,002		1,56	-0,002	b	2,51	-0,005	a	3,64	0,006		-0,36	-0,002	a	3,37
-3	0,004		0,87	0,015		-0,81	-0,008	a	3,56	-0,004	a	3,36	-0,006		0,34	-0,006	a	3,49	-0,003	b	2,57	0,002	b	2,11	0,002		0,57
-2	0,004		-0,13	0,004		-0,87	0,004		1,12	-0,001	a	3,15	-0,004		1,11	0,001		0,49	-0,002	b	2,36	0,004		1,18	0,007		-0,97
-1	0,020		-3,63	0,009		-1,25	0,017		-0,55	0,007		-1,54	0,013		-2,40	0,006		-0,38	0,007		-1,29	-0,005	b	2,49	0,001	a	3,23
0	0,003		0,83	-0,002	a	3,45	0,005	a	2,93	0,007		0,71	-0,005	a	3,33	0,006		-1,09	0,002		0,37	-0,003	a	3,06	0,004		-0,63
1	0,003		1,28	0,005		0,25	0,004		0,32	-0,006	a	2,76	0,005		0,70	-0,001	b	2,31	0,004		1,21	0,008		-1,25	0,002	b	2,01
2	0,002		1,31	-0,013	a	4,10	-0,003	b	2,14	-0,002	b	2,08	-0,006	a	2,61	0,002		1,08	-0,007	a	2,89	0,005		1,35	0,001		1,16
3	0,002	a	2,62	-0,005	b	2,11	0,002	c	1,77	0,003		1,61	0,003	b	2,06	0,003		1,46	0,001		1,57	0,000		1,42	0,000	c	1,70
4	0,000		1,05	0,008		-0,30	-0,004	b	2,57	-0,002	a	3,43	0,001	b	2,34	0,001	c	1,74	-0,003	a	2,91	-0,001	b	2,46	-0,003	b	2,44
5	0,000	c	1,68	-0,007	a	3,35	-0,001	c	1,83	0,002	b	2,21	-0,001		1,61	0,005		1,33	0,003		0,89	-0,002	a	2,82	-0,001		0,72
6	-0,005	a	4,27	0,003		1,53	-0,001	a	2,96	0,002	b	2,08	0,002		0,64	-0,002	b	2,34	0,002		0,55	0,004		1,49	-0,003	a	3,22
7	0,000		0,82	-0,004		0,59	-0,011	a	4,84	-0,003	a	3,16	0,016		-0,20	-0,002	b	2,19	0,001		0,45	-0,001	b	2,12	0,003		0,46
8	0,004	a	2,89	-0,002	b	1,97	0,002		1,49	0,004	a	3,25	0,009		1,20	-0,002	a	3,83	-0,004	a	2,65	0,002		0,10	0,000		0,35
9	-0,006	b	2,37	0,005		1,23	0,001	b	2,46	-0,005	a	3,40	0,003		1,39	-0,006	a	4,56	0,000	b	2,21	0,001		-0,15	0,000	b	2,53
10	0,002		0,51	-0,008	a	4,26	-0,006	a	4,45	-0,003	a	3,23	-0,002	b	2,25	-0,001	b	2,34	-0,005	a	2,90	0,001		0,36	-0,002		0,85
11	-0,001	c	1,80	-0,001		-0,08	0,006		0,75	-0,007	a	3,90	0,008		0,87	-0,003	a	4,35	0,006		-1,48	-0,003	a	3,11	-0,002	b	2,55
12	0,003		0,60	-0,003	a	2,64	0,007		0,36	0,001	a	2,77	-0,006	b	2,43	-0,001		1,25	-0,001		0,69	0,002		1,43	0,008		-0,66
13	0,002		0,75	0,001		0,65	-0,002	a	3,05	-0,003	a	3,07	-0,002	c	1,74	0,001	b	1,98	-0,001	b	2,06	0,004		-1,18	0,002		-1,13
14	0,003		1,24	-0,001		0,87	-0,002		1,34	-0,003	b	2,10	-0,001	c	1,75	0,003		0,07	0,000		0,13	-0,002	b	2,26	0,002		-0,21
15	-0,003		1,12	0,000	c	1,92	0,009		-2,15	-0,003	a	3,05	0,002		1,14	-0,003	a	4,37	-0,002	b	2,16	0,001	c	1,67	0,001		0,13

B: Bad News

Time	ZEW (32)			PMI (19)			IFO (26)			Ind. Prod. (33)			GDP (7)			Retail Sales (29)			Trade Bal. (30)			CPI (18)			PPI (20)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	-0,003	a	2,66	-0,002	c	1,87	0,001		0,85	0,000	b	2,48	0,002		-0,28	-0,003	a	2,99	-0,011	a	3,01	0,005		0,90	-0,009	a	4,43
-4	0,005		1,61	-0,007	a	3,36	0,004		-0,12	0,000	a	2,92	0,001		-1,48	-0,003	a	3,36	0,001		1,20	0,002		0,22	-0,002	b	2,52
-3	-0,002	a	3,00	-0,022	a	3,54	-0,001	a	2,66	-0,002	b	1,98	-0,005	a	3,48	0,004	c	1,66	0,001	a	3,15	-0,004	b	2,47	0,001		1,61
-2	0,002		0,62	-0,004	b	2,57	-0,005	a	2,88	0,001		-0,35	-0,002		1,18	-0,003	b	2,52	0,009		-0,70	-0,001		1,64	0,005		-0,41
-1	-0,007	a	2,78	-0,019	a	4,94	-0,003	b	2,18	-0,001	a	2,93	0,004		0,05	0,000		1,39	0,005		-0,03	-0,002		1,54	0,008		-1,66
0	0,000	b	2,10	-0,004	b	2,44	0,012		-0,72	-0,002	a	3,71	-0,004		0,66	0,000	c	1,94	-0,004	a	3,67	0,004		0,49	0,007		-1,39
1	0,000	b	2,14	0,007		-0,77	0,000	a	2,66	-0,001	b	2,32	0,012		-1,01	-0,001	b	2,50	-0,001		0,93	0,001		1,58	0,002		1,35
2	0,009		-0,55	-0,009	a	3,38	0,008		-0,24	-0,002	a	4,24	-0,007	b	2,10	0,000	a	3,23	0,000		1,39	0,005		0,65	-0,003	b	2,45
3	0,000		1,42	0,005		0,49	0,001		-0,08	0,002	a	3,49	-0,003	c	1,79	0,003		0,01	0,006		-2,36	0,001		0,89	0,002		0,45
4	0,004		0,26	-0,003		1,53	-0,006	a	4,41	0,002	c	1,66	-0,012	a	4,67	-0,002	b	2,53	-0,003	b	2,34	0,002		0,88	-0,002	c	1,85
5	0,006		0,81	0,011		-1,28	0,002		1,32	0,000	b	2,50	-0,004	b	2,15	-0,003	a	2,72	-0,001	b	2,33	-0,007	a	2,97	-0,006	b	2,46
6	0,001		1,05	-0,010	a	3,74	0,000		0,41	-0,002	a	3,24	-0,008	a	2,71	0,003		0,30	0,000	c	1,80	-0,004	b	2,52	0,001		0,44
7	-0,002	c	1,65	-0,006	a	3,54	0,004		0,76	0,002	a	2,82	-0,001	b	2,34	-0,002	a	3,10	0,000	c	1,84	-0,005	b	2,21	0,001		1,11
8	0,000	a	2,64	-0,007	a	2,94	0,003		0,40	-0,001	a	3,48	-0,003		0,85	-0,001	a	3,01	0,000		1,26	0,002		0,35	0,002	c	1,68
9	0,001		1,11	0,000		0,39	-0,002	a	2,66	0,000	a	3,04	-0,003	b	2,54	-0,003	a	4,47	-0,004	b	2,45	0,004		0,51	0,003		-0,17
10	0,001		0,82	0,004		-0,85	-0,006	a	3,46	0,002	b	2,37	0,000		1,46	-0,002	b	2,10	-0,002		1,26	-0,002		1,26	0,001	c	1,84
11	0,000	b	2,04	0,005		-2,29	0,000	a	2,66	0,002		0,65	-0,008	c	1,83	-0,002	a	3,89	0,008		-1,33	0,003		-0,74	0,000	c	1,69
12	0,000	b	2,41	0,006		0,77	0,004		0,29	0,001	b	2,40	0,008		-1,74	-0,002	b	2,32	-0,004	a	3,04	0,000		0,63	-0,004	a	3,75
13	0,002		-0,08	-0,005	a	3,33	0,001	c	1,70	0,002	a	3,02	-0,002	a	2,90	0,002		-0,13	0,000		1,25	-0,001		0,96	0,004		-0,26
14	0,005		1,18	0,000		1,48	-0,001	a	2,77	0,002	b	2,30	0,011		-0,29	-0,002	b	2,44	0,005		0,15	0,001		1,33	0,004		-0,43
15	-0,003	a	3,94	-0,003	a	3,16	0,000	a	3,04	0,001	a	2,89	0,005		-1,33	0,001	a	2,58	0,004		0,52	0,003		-1,03	0,004		1,47

C: Neutral News

Time	ZEW (1)			IFO (1)			Ind. Prod. (3)			GDP (4)			Retail Sales (7)			Trade Bal. (2)			CPI (19)			PPI (20)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	-0,002		1,00	-0,014		1,55	0,003		-0,74	-0,005	a	2,85	-0,003		0,98	0,004		-0,23	-0,002	b	2,06	-0,005	a	3,04
-4	0,000		0,33	0,000		0,16	0,008		-2,05	0,000		0,06	-0,009	a	4,20	-0,011		0,98	-0,002	a	2,69	0,005		-0,34
-3	-0,002		0,97	0,000		0,16	0,003		0,13	0,002		0,62	0,000		0,79	-0,026	a	2,83	-0,011	a	5,37	0,007		-0,20
-2	-0,004		1,42	0,031		-1,47	-0,010	b	2,18	-0,002		1,45	-0,003	c	1,81	-0,006		0,91	0,000		1,29	0,003		-0,21
-1	0,027		-1,69	-0,021	c	1,69	0,005		-0,28	0,000		-0,12	0,012		-1,17	0,005		-0,30	0,002		1,50	0,000	b	2,03
0	0,000		0,33	-0,002		0,49	0,002		-0,58	-0,005	b	2,30	0,006		-0,24	-0,002		1,26	-0,003	b	2,27	0,001		1,53
1	0,012		-1,39	0,010		-0,89	0,010		0,07	0,025		-0,64	0,004		-0,51	0,013		-1,16	0,005		-0,29	-0,004		1,63
2	0,015		-1,58	0,017		-1,00	-0,003	b	2,02	0,011		0,15	0,010		-0,95	0,007		-0,75	-0,006	a	4,03	-0,004		1,16
3	-0,009	b	2,19	0,000		-0,15	-0,004	b	2,18	-0,006	c	1,79	0,005		0,56	0,016		-0,62	0,001		1,59	0,007		0,23
4	-0,004	c	1,77	0,000		0,46	0,004		0,10	-0,010	a	3,33	-0,006		1,51	0,000		1,20	-0,007	a	3,67	0,000	b	2,43
5	0,000		-0,28	-0,007		1,08	-0,002		0,79	0,003		0,54	0,008		-0,40	0,000		1,14	-0,001		0,76	-0,003		1,34
6	0,000		-0,46	-0,049	b	2,19	0,000		0,41	0,001		0,17	-0,003	a	3,22	0,013		-0,83	-0,003	a	2,70	-0,002		1,51
7	0,000		-0,25	-0,021		1,53	0,002		1,43	-0,013		1,18	0,007		-0,43	-0,007	c	1,90	0,001		-0,37	0,001		0,80
8	-0,004		1,39	0,015		-1,23	0,015		-1,65	0,000	c	1,75	-0,004	b	2,46	-0,008	b	1,99	-0,006	a	3,47	0,002		0,27
9	0,000		-0,31	0,003		-0,20	-0,001	b	2,00	0,000		1,25	-0,006	b	2,28	0,003		0,34	-0,004		0,73	0,001		1,62
10	0,000		-0,38	-0,004		0,81	-0,004	b	2,02	0,000		0,31	-0,002	b	2,57	0,004		0,69	0,005		0,33	-0,005		1,60
11	0,000		-0,33	-0,033	b	2,06	-0,006	a	2,98	0,020		-0,01	0,001		0,22	0,013		0,28	0,000		0,23	0,002		1,27
12	0,005		-0,92	-0,052	b	2,27	-0,011		-0,13	0,003		-0,12	-0,003		1,53	0,001		0,86	-0,002	b	2,01	0,002	c	1,86
13	0,000		-0,44	-0,023	b	2,03	0,000		0,74	0,000		1,02	0,008		-0,21	0,003		0,98	-0,001		1,53	0,001		0,70
14	0,000		0,92	-0,019	c	1,90	-0,005	b	2,35	-0,009	b	2,35	0,000		1,04	0,015		-0,73	0,000		0,81	0,000		0,91
15	0,000		-0,36	0,029		-1,55	-0,004	b	1,97	-0,006	c	1,79	-0,002	c	1,89	0,026		-1,86	0,003		0,75	0,001		-0,58

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: ZEW – German Economic Sentiment Index, PMI – Purchasing Managers' Index, IFO – German Business Climate Index, Ind. Prod. – industrial production, GDP – gross domestic product, Retail Sales, Trade Bal. – trade balance, CPI – consumer price index, PPI – producer price index. Due to the absence of neutral news for PMI, the abnormal returns are not reported. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 3: Effect of Macroeconomic Announcements on Abnormal Returns of HUF/EUR

A: Good News

Time	ZEW (1)		PMI (13)		IFO (31)		Ind. Prod. (24)		GDP (9)		Retail Sales (23)		Trade Bal. (23)		CPI (21)		PPI (24)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,005	1,61	0,006	-0,10	-0,002 a	3,02	0,003	-0,79	0,001	0,18	0,000	1,32	0,000	0,77	0,005	0,36	-0,003 c	1,89
-4	-0,002	1,55	0,008	-0,94	-0,001	1,03	0,002	0,77	0,000	1,04	0,012	0,89	0,004 c	1,79	0,005	0,35	-0,003 c	1,88
-3	0,001 b	2,25	0,012	0,68	-0,004 a	3,28	0,006	0,49	-0,002	1,33	-0,004 b	2,32	-0,004 b	2,21	0,008	0,08	-0,004 a	3,26
-2	0,004	0,00	0,002 b	2,30	-0,002 a	2,83	-0,002 b	2,32	0,000	1,03	-0,005 a	2,85	-0,007 a	3,13	-0,004 b	2,30	-0,011 a	3,33
-1	0,018	-2,92	0,020	-3,18	0,024	-0,78	0,016	-0,74	0,008	-0,01	0,011	-0,91	0,006	-0,28	0,009	0,04	0,006	0,78
0	0,011	-1,92	-0,002 a	3,42	0,013	-0,24	0,005	-0,38	0,000	0,68	-0,002 a	3,06	0,003 b	2,21	0,000 c	1,78	-0,001	1,34
1	0,004	0,87	0,003	1,33	-0,003 a	3,32	0,000 a	2,68	-0,002 c	1,96	-0,002 b	2,26	-0,004 b	2,15	0,003	0,48	0,001	1,15
2	-0,005 a	3,71	-0,004 c	1,70	0,005	0,72	0,000 b	2,25	0,000	0,84	0,002	1,24	-0,005 b	2,26	0,005	0,81	0,000	1,02
3	0,001 a	2,59	-0,001 b	2,09	0,002 b	2,22	0,008	-0,41	-0,034 b	2,57	-0,004 a	3,17	0,006 b	2,35	0,002	1,61	0,001	0,98
4	0,008	-0,01	-0,010 a	3,15	-0,005 a	3,00	0,003 b	2,06	0,017	-0,20	-0,011 a	4,56	0,008	0,33	0,003	-0,15	0,002 c	1,87
5	-0,005 a	3,98	0,002	0,92	-0,001 a	3,42	-0,001 a	2,81	0,010	1,28	0,004	-0,29	0,002	1,41	-0,008 a	3,91	-0,003 a	3,00
6	-0,008 a	3,55	0,002	0,20	-0,007 a	3,61	-0,006 a	2,98	0,002	1,14	-0,001 a	2,84	0,000 a	2,62	0,008	-0,78	-0,008 a	4,36
7	0,004	1,07	-0,003	1,46	-0,001 a	2,81	0,002	1,24	-0,002	1,04	0,001 c	1,70	0,011	-2,97	0,004	-0,22	0,000 a	3,49
8	-0,002 a	2,70	-0,006 c	1,93	-0,004 a	3,29	-0,006 a	2,95	0,010	1,24	-0,002 b	2,34	0,000	0,31	0,002	1,22	0,005	0,56
9	-0,005 a	3,67	-0,007 a	2,90	0,003	1,00	0,000	0,79	0,011	-0,80	-0,001 b	1,97	0,008	0,04	0,000	1,40	0,003	1,54
10	-0,003 a	2,61	0,004 b	2,01	-0,003 a	3,03	-0,004 a	3,42	-0,003 c	1,72	-0,001 a	3,40	-0,011 a	4,04	-0,003 b	2,00	-0,004 c	1,87
11	0,000	1,22	0,001	-0,01	0,000 b	2,40	0,005	0,64	-0,001 c	1,83	0,001	0,76	0,001 b	2,57	0,003	1,52	0,001	0,46
12	0,007 b	2,18	0,002 c	1,95	-0,004 a	3,75	-0,002 a	2,82	0,002	1,03	-0,008 a	4,21	0,003	1,31	0,000 b	2,19	0,003	-0,77
13	0,001	0,47	-0,006 a	2,77	-0,006 b	2,50	0,004	0,57	0,001	1,00	0,000 c	1,83	-0,001 a	2,71	-0,003 a	2,82	0,003	0,91
14	0,003 b	2,44	-0,002	1,64	-0,001	1,12	-0,002 b	2,14	0,001	0,89	-0,001 c	1,92	-0,004 a	3,48	-0,007 a	4,43	-0,001 a	2,70
15	-0,004 b	2,40	0,004	-0,42	0,000	1,29	-0,001 b	2,53	-0,007	1,46	0,004	1,57	0,005	0,89	-0,002 c	1,71	0,010	-0,69

B: Bad News

Time	ZEW (32)		PMI (19)		IFO (26)		Ind. Prod. (33)		GDP (7)		Retail Sales (29)		Trade Bal. (30)		CPI (18)		PPI (20)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	-0,001 b	2,47	-0,004 b	2,57	0,001 c	1,73	-0,006 a	3,17	-0,002 c	1,89	0,002	0,31	-0,004	1,42	0,007	-0,66	-0,003 b	2,22
-4	0,007	-1,08	0,002	0,42	-0,004 a	3,35	0,000 a	2,81	-0,001	1,04	-0,004 a	2,58	0,013	0,70	-0,004 b	2,32	-0,001	0,40
-3	0,004	-0,30	-0,020 a	4,07	-0,005 b	2,56	0,000	0,38	0,000	-1,30	-0,003 a	2,63	0,007	1,27	0,005	-0,64	0,003 b	2,27
-2	0,003 b	2,03	0,000	1,36	-0,003 b	2,52	0,000 a	3,69	-0,005 b	2,56	-0,001 c	1,82	0,008 b	2,47	0,005	0,51	0,000 c	1,67
-1	-0,011 a	4,75	-0,009 b	2,03	-0,006 a	2,80	-0,016 a	5,51	-0,023	0,89	0,001	1,43	0,000 a	2,62	0,003	0,07	0,002	1,21
0	-0,009 a	4,46	-0,003 b	2,33	-0,005 b	2,54	0,001 a	2,76	0,004	0,49	-0,002	1,35	0,001	1,15	0,011	-0,83	0,005	0,02
1	0,001 c	1,73	-0,002 b	2,38	-0,004 a	3,21	-0,001 b	2,07	0,003	0,24	0,001	0,69	-0,001 b	2,32	-0,001	1,27	0,001 c	1,96
2	0,005	-0,32	0,002	1,24	0,004	0,63	0,003 b	2,02	-0,012 b	2,30	-0,011 a	4,50	-0,012	1,63	0,003 a	2,64	0,000 c	1,94
3	0,004	1,44	-0,002	1,20	0,002	0,05	0,002 c	1,80	-0,002 b	1,96	0,006	-1,20	0,003	0,66	0,006	1,06	0,004	0,25
4	0,001	0,79	-0,004 b	2,51	0,000 b	2,26	0,000 a	3,05	-0,009 a	2,79	-0,001 a	3,15	-0,010 a	3,49	-0,002	1,46	-0,003	1,43
5	0,004	0,99	0,000 c	1,81	0,004	1,38	0,007	1,30	-0,007 b	2,26	0,005	0,75	-0,010 a	4,69	-0,002 b	2,21	-0,003 a	2,97
6	0,000	1,22	-0,003	0,77	0,000 a	2,75	-0,001 a	4,11	0,001	0,99	0,003	0,96	0,003	0,10	0,000	1,54	-0,001 b	2,53
7	0,003	1,62	0,002 b	2,53	0,000 b	2,00	-0,001 c	1,92	0,006	-0,91	-0,003 a	3,73	0,003	-0,27	0,000	0,16	0,003	-0,32
8	-0,002 c	1,67	-0,005 c	1,68	-0,002 a	3,77	0,005	1,22	-0,007 b	2,52	-0,005 a	4,25	-0,002 a	2,75	0,000	1,32	-0,003 a	4,27
9	0,001 b	2,28	-0,004 a	3,38	-0,002 a	3,04	-0,004 b	2,45	-0,006 b	2,22	0,005	1,63	0,003	0,44	-0,008 a	4,07	0,002	0,47
10	-0,001 b	2,21	-0,003 c	1,76	0,006	-1,24	0,001 a	3,18	-0,006 a	3,44	-0,001 c	1,89	0,008	0,31	-0,006	1,51	-0,006 a	2,99
11	0,000	0,20	0,005	0,31	-0,002 b	2,49	0,001 b	2,53	0,010	-1,35	-0,002 b	2,12	0,012	1,46	-0,005 a	2,63	-0,005 a	2,99
12	-0,003 a	3,33	-0,004 a	4,12	0,002 b	2,42	0,004	0,11	0,000	0,99	0,002 b	1,97	0,004	0,71	0,000	1,33	0,002	0,10
13	-0,001 c	1,96	-0,003 c	1,82	0,000	1,31	0,000 b	2,22	-0,005 a	2,91	-0,005 a	3,63	-0,003 c	1,71	-0,010 a	3,17	-0,009 a	3,03
14	0,010	-0,51	-0,005 a	2,83	0,004	0,10	-0,002 a	3,74	-0,008 b	2,14	0,003 b	1,99	-0,005 a	3,08	-0,006 c	1,65	-0,001	1,35
15	0,001 b	2,21	-0,007 b	2,29	0,001 b	1,98	0,002 c	1,94	0,001	1,30	0,000 c	1,91	0,002 a	2,64	-0,003 a	3,29	-0,013 a	3,03

C: Neutral News

Time	ZEW (1)		IFO (1)		Ind. Prod. (3)		GDP (4)		Retail Sales (7)		Trade Bal. (2)		CPI (18)		PPI (14)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,003	-0,53	0,000	0,27	0,002	0,05	-0,024 c	1,76	0,014	0,45	-0,017	1,61	0,007	-0,66	-0,002 b	2,05
-4	0,017	-1,23	-0,003	0,69	-0,007 b	2,15	-0,014	1,32	-0,003 c	1,65	-0,004	1,48	-0,004 b	2,32	-0,001 c	1,79
-3	-0,007	1,53	0,003	-0,17	0,001	-0,05	0,003	0,50	0,005	0,09	0,002	0,05	0,005	-0,64	0,016	-2,61
-2	0,000	0,13	-0,003	0,69	0,025	-0,72	-0,003	0,47	-0,001 b	1,97	-0,003	1,46	0,005	0,51	0,008	0,07
-1	0,000	0,13	0,019	-1,47	-0,029 a	2,68	-0,002	1,02	0,004	0,16	0,025	-1,43	0,003	0,07	-0,001 b	2,36
0	-0,003	1,05	-0,009 c	1,66	0,008	-0,01	-0,003	1,29	0,008	-0,89	-0,004 c	1,75	0,011	-0,83	-0,011	1,16
1	0,003	-0,25	0,010	-1,23	-0,006 b	2,40	0,003	-1,33	0,013	0,66	0,012	-1,43	-0,001	1,27	-0,004	0,70
2	0,003	-0,76	0,003	-0,89	-0,004	1,08	0,000	1,51	-0,011 a	2,83	0,004	-0,51	0,003 a	2,64	-0,001	1,33
3	-0,003	1,18	-0,003	1,13	0,000	1,08	-0,003 c	1,86	-0,007	0,55	0,010	-0,53	0,006	1,06	0,004	-0,16
4	0,007	-0,78	0,000	0,65	0,004	0,38	0,003	0,20	0,016	0,70	-0,014 b	2,01	-0,002	1,46	-0,004 c	1,65
5	-0,010 c	1,87	0,013	-1,31	0,003	-0,53	0,007	1,23	0,005	0,43	-0,001	0,47	-0,002 b	2,21	-0,001 b	2,09
6	0,003	-0,23	0,026	-1,53	0,004	0,04	0,013	0,42	0,005	0,23	0,006	-0,90	0,000	1,54	0,002	1,40
7	0,000	0,49	0,007	-0,94	-0,005 b	2,02	-0,017	1,22	0,011	-0,95	0,002	0,77	0,000	0,16	-0,005 b	2,50
8	-0,007	1,63	0,019	-1,45	0,011	0,30	-0,004	0,62	-0,008	1,62	0,014	-1,50	0,000	1,32	0,002	0,43
9	-0,007 c	1,84	0,007	-1,18	0,006	-1,65	0,014	0,25	-0,005 a	2,79	-0,009	1,16	-0,008 a	4,07	-0,001 b	2,25
10	-0,007	1,61	-0,032 b	2,19	-0,002	0,97	0,003	0,05	-0,007 a	2,96	0,003	0,66	-0,006	1,51	-0,006 b	2,05
11	-0,007	1,21	0,007	-1,21	0,005	-0,01	-0,012 a	3,01	-0,004 c	1,71	0,009	-0,79	-0,005 a	2,63	0,004	-0,82
12	-0,003	1,15	-0,025 b	1,98	-0,020 c	1,86	0,010	0,70	0,001	0,59	0,004	-0,32	0,000	1,33	0,002	0,82
13	0,010	-1,13	-0,009	1,63	0,010	-0,59	-0,005 b	2,50	0,003	-0,87	-0,001	1,05	-0,010 a	3,17	-0,008 a	3,31
14	-0,007	1,23	-0,003	1,18	0,007	-0,08	0,000	0,97	0,007	0,62	0,004	0,54	-0,006 c	1,65	-0,002 b	2,26
15	-0,007 c	1,66	0,000	-0,12	0,004	0,70	0,010	-0,33	-0,015	1,27	-0,008	0,41	-0,003 a	3,29	0,004	0,33

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: ZEW – German Economic Sentiment Index, PMI – Purchasing Managers' Index, IFO – German Business Climate Index, Ind. Prod. – industrial production, GDP – gross domestic product, Retail Sales, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. Due to the absence of neutral news for PMI, the abnormal returns are not reported. TCZ is the Corrado–Zivney TCZ rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 4: Effect of Macroeconomic Announcements on Abnormal Returns of CZK/USD

A: Good News

Time	NFP (30)		PMI Man (31)		PMI Non-Man (30)		Retail Sales (18)		GDP (7)		Ind. Prod. (23)		Core DGO (20)		Trade Bal. (24)		CPI (16)		PPI (16)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,007	-0,04	0,002	1,64	0,001 c	1,73	-0,002 b	2,02	0,017	-0,05	-0,005 b	2,11	0,005	1,63	-0,007 a	3,08	0,001 c	1,68	0,003	0,71
-4	0,013	-0,86	0,002	1,37	-0,002 b	2,22	0,001	1,45	0,009	-0,57	0,005	0,23	-0,005 a	2,94	-0,006 a	3,89	-0,011 a	3,57	-0,009 a	3,63
-3	0,017	-0,74	-0,001 b	2,03	0,004 c	1,73	0,005	0,83	0,000	0,92	-0,005 a	2,98	-0,004 c	1,86	0,001 b	2,32	-0,001	0,51	0,009	-0,54
-2	-0,005 c	1,92	0,002	0,69	0,008	1,42	0,000	1,28	-0,014 a	3,99	-0,012 a	4,17	-0,003 a	3,37	-0,002 c	1,86	0,017	-2,04	-0,002	1,30
-1	-0,204 a	5,05	-0,008 a	3,36	-0,041 a	5,90	-0,063 a	6,28	-0,081	1,05	0,013	-1,12	-0,043 a	4,00	-0,025 a	4,24	0,029	-2,04	0,036	-1,12
0	-0,029	1,09	-0,011 a	5,10	-0,002 a	2,79	0,000	1,09	-0,005	0,69	0,007	-0,51	0,000	1,50	0,013	-0,52	-0,007 c	1,77	-0,010	0,38
1	-0,004 a	3,29	-0,004 b	2,21	-0,011 a	4,40	0,005	0,20	-0,019 b	2,46	0,002	1,59	0,021	-1,32	-0,002 c	1,91	0,005	0,90	0,005	0,48
2	-0,016 b	2,56	-0,001	0,74	-0,003 a	3,07	0,004	1,61	0,039	-0,19	0,004	0,16	-0,005 a	2,74	-0,019 a	3,18	-0,007 b	2,06	0,012	-0,01
3	0,002	0,91	0,007 c	1,76	0,004	0,08	-0,009 b	2,07	-0,027 b	2,12	0,004	0,04	0,004	1,18	0,003	1,56	-0,001	1,49	0,011	-0,10
4	-0,019 a	4,83	-0,013 a	4,59	0,000 c	1,95	-0,002 c	1,93	0,000	0,60	0,002 c	1,85	-0,016 a	3,72	-0,003	1,21	0,001	0,82	-0,003	1,51
5	-0,019 a	4,31	0,000 a	2,79	-0,005 a	3,06	0,000 b	2,05	0,003	0,34	-0,001 b	2,55	-0,005 b	2,05	-0,014 a	2,83	-0,005	1,43	-0,005 b	2,42
6	-0,005 c	1,86	0,000 a	2,91	-0,001 b	2,05	0,016	-0,74	0,002	0,75	-0,003 a	2,72	0,002 c	1,82	-0,009 a	3,51	0,009	1,17	-0,005	1,32
7	0,002	1,32	0,012	-0,10	0,002	1,14	0,003	1,11	0,016	-0,47	-0,004 a	3,02	0,001 c	1,70	0,003	1,00	0,000 c	1,92	-0,005 b	2,30
8	-0,006 a	3,32	0,000 b	2,12	0,011	0,58	0,013	0,43	0,036	-0,77	0,005	-0,10	-0,002 b	2,36	0,004	0,80	-0,012 a	3,17	0,011	-0,46
9	-0,014 a	4,10	-0,003 a	3,32	0,004	1,10	0,016	-0,34	-0,002	1,55	0,001	1,64	0,002	0,53	-0,005 a	2,64	-0,007 c	1,86	0,021	-1,98
10	-0,014 a	4,09	0,002	1,28	-0,006 a	3,18	-0,003 b	1,98	0,012	-0,73	-0,004 a	3,29	0,000 b	2,02	-0,004 b	2,12	0,000	1,14	0,005	1,31
11	0,003	0,55	0,005	1,35	0,000	1,10	0,016	-0,89	0,013	-0,70	-0,006 b	2,32	0,004	1,26	-0,015 a	2,79	0,004	0,08	-0,012 a	3,11
12	0,006 b	2,11	-0,011 a	3,56	0,000	1,26	0,009	1,14	-0,003 c	1,76	-0,002 b	2,11	0,002	0,88	0,000 c	1,91	0,001 c	1,70	0,003	0,44
13	-0,007 a	3,39	-0,002 b	2,45	0,007 c	1,65	0,005	0,43	-0,003 b	2,11	-0,002 b	2,19	0,001	1,41	0,014	-1,23	-0,007 b	2,03	-0,005 a	2,85
14	-0,020 a	5,51	0,006	0,23	0,010	-0,07	-0,005 b	2,43	-0,004	1,01	0,004	0,96	0,007	0,15	-0,014 a	3,00	0,012	0,51	0,002	0,46
15	0,015	-1,10	0,002	1,27	-0,003 a	2,67	0,010	0,14	0,008	0,79	-0,007 a	2,85	0,005	0,26	0,004	1,04	0,001 c	1,88	-0,009 a	3,12

B: Bad News

Time	NFP (29)		PMI Man (28)		PMI Non-Man (26)		Retail Sales (24)		GDP (11)		Ind. Prod. (31)		Core DGO (38)		Trade Bal. (26)		CPI (5)		PPI (17)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,002	1,29	-0,006 a	3,92	0,000 c	1,74	0,005	-0,32	0,002	1,63	-0,004 a	3,28	0,004	0,93	0,009	0,11	0,008	-0,34	-0,001	1,53
-4	-0,005 a	3,70	0,001 b	2,16	0,008	0,16	-0,010 a	4,52	0,019	-0,96	-0,001 c	1,90	0,000 b	2,43	-0,004 a	2,71	0,007	-1,15	0,000	1,22
-3	0,004 c	1,70	0,002	0,93	0,002	1,20	0,009	-0,47	0,010	-0,38	-0,002	1,29	0,003	1,63	-0,002	1,56	0,002	0,12	0,007	1,11
-2	0,000 b	2,32	0,012	0,10	0,009	0,46	0,014	1,44	-0,016 a	2,81	-0,012 a	4,19	0,001 b	2,03	-0,012 a	5,29	-0,001	1,19	0,008	-0,46
-1	0,128	-1,25	0,022	-0,89	0,042	-3,31	0,080	-1,47	0,026	1,10	-0,001	1,08	0,015	0,68	0,023	-3,08	-0,071 a	5,23	-0,016 a	4,21
0	-0,014 a	4,36	0,002	0,08	-0,004 a	2,89	0,014	-0,93	0,037	-2,67	0,005	-0,35	0,003	1,15	-0,012 a	4,16	-0,010 c	1,95	0,005	-0,20
1	0,014	1,34	-0,017 a	3,73	-0,005 a	2,62	-0,015 a	3,55	-0,010 a	2,68	0,003	1,27	0,009	0,14	0,008	1,54	0,031	-1,10	0,000 b	2,08
2	-0,001 a	2,82	-0,008 b	2,28	0,011	-0,06	0,021	-0,01	0,008	0,89	0,004	1,26	0,004 c	1,80	0,021	0,55	-0,016 b	2,20	-0,005 b	2,20
3	0,012 b	2,35	0,004	1,04	-0,005 a	2,90	0,005	1,12	0,004 c	1,94	0,002	1,03	0,007	0,89	0,017	1,37	0,022	-1,11	0,012	-0,04
4	0,000 a	2,92	0,014	-0,32	-0,001 b	2,25	0,013	0,60	-0,012 a	2,85	-0,003 a	3,09	-0,003 b	2,31	0,010	0,32	0,017	-0,02	0,011	-1,14
5	-0,006 b	2,26	0,000 b	2,21	-0,017 a	4,96	0,006	1,58	0,004	1,32	0,001 b	1,98	-0,005 a	3,85	-0,010 a	3,98	0,000	0,87	0,007	0,39
6	0,003	1,59	-0,003 a	2,74	0,014	1,53	-0,013 a	2,82	0,009	0,52	0,003 a	2,62	0,004 c	1,85	-0,008 a	2,87	-0,005	0,91	-0,005 b	2,50
7	-0,005	1,63	-0,008 a	3,03	0,022	-0,91	0,010	0,31	0,040	-1,06	-0,008 a	3,82	0,008	0,08	0,013	0,12	0,019	0,39	0,002 c	1,90
8	0,004 c	1,69	-0,007 a	3,58	0,000	1,20	-0,004 a	2,72	0,002	1,59	0,005	1,36	-0,008 a	4,28	-0,004 a	2,67	-0,014 a	2,59	0,009	0,73
9	0,010	-0,58	0,005	1,34	-0,004 a	3,91	0,009	-0,41	0,010	0,55	0,008	-0,27	0,005	1,03	0,011	0,50	-0,006 b	2,10	0,001 b	2,21
10	-0,002 a	2,76	-0,001 a	2,71	-0,005 b	2,38	0,001	1,46	0,000	1,52	0,004	1,33	-0,013 a	6,39	-0,004 b	2,51	0,005	0,73	-0,004 a	2,62
11	-0,002 a	2,99	-0,001 a	2,65	-0,004	1,54	-0,005 a	3,80	0,001	0,90	-0,001	1,52	-0,011 a	3,97	0,002 c	1,90	0,006	-0,40	-0,003 b	2,35
12	-0,009 a	3,77	0,004	1,46	0,001 c	1,76	-0,002 b	2,11	-0,022 a	3,66	-0,004 a	3,14	0,003	1,42	0,006	1,19	-0,011	1,57	-0,006 b	2,25
13	0,002	1,29	-0,005 a	2,96	0,010	0,80	0,000 a	2,58	0,022	0,05	0,008	1,06	-0,001 b	2,38	0,001 c	1,85	-0,002	1,41	0,006	0,21
14	0,000	1,49	0,000 b	2,12	0,002 b	2,01	0,022	-1,59	0,012	0,08	-0,013 a	3,15	0,006	0,77	-0,001 b	2,38	0,022	-0,93	0,004	0,46
15	0,009	1,52	-0,011 a	3,62	-0,010 a	2,93	-0,002 a	2,75	-0,004 b	2,08	0,001 a	3,12	0,002	1,64	0,000 c	1,69	0,015	0,36	-0,006 c	1,71

C: Neutral News

Time	NFP (1)		PMI Man (1)		PMI Non-Man (4)		Retail Sales (5)		GDP (2)		Ind. Prod. (5)		Core DGO (1)		Trade Bal. (1)		CPI (18)		PPI (6)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,032	-0,92	0,000	0,24	0,003	0,17	0,008	-0,11	-0,005	1,05	0,010	-0,71	0,023	-1,42	-0,026	1,47	0,000	1,16	-0,001	1,32
-4	-0,092 b	2,30	0,010	-0,60	0,025	-0,40	0,005	0,53	0,012	-0,64	0,006 c	1,92	0,014	-1,19	-0,010	0,81	0,004	0,31	-0,008 b	2,06
-3	-0,032 c	1,77	-0,020	1,55	0,003	-0,01	0,009	-0,02	-0,012 b	2,01	0,021	-2,53	-0,009	1,58	-0,063 b	2,24	0,006	-0,92	-0,014 a	3,03
-2	0,005	0,12	0,000	0,24	0,007	0,21	0,005	-0,18	0,049	-2,18	-0,022 a	3,16	0,028	-1,50	0,016	-0,73	0,002	0,27	-0,001	1,50
-1	0,037	-1,10	0,000	0,24	0,011	-0,73	0,006	1,05	-0,073 a	3,12	-0,003	1,19	0,009	-0,89	0,000	0,21	-0,077 a	5,83	0,026	0,16
0	-0,032 c	1,79	0,000	0,24	0,010	-0,17	-0,007	0,64	0,022	-1,20	-0,011	1,45	-0,005	1,26	0,016	-0,76	-0,001	0,13	0,020	-0,74
1	0,000	0,48	0,000	0,54	0,002	1,04	0,015	-0,16	-0,037 b	2,23	0,012	-0,75	0,032	-1,39	-0,073 b	2,06	-0,021 b	2,47	0,011	0,80
2	-0,134 b	2,35	-0,010	0,62	0,031	-1,01	-0,003	1,11	0,063	-1,86	-0,001	1,41	0,028	-0,97	-0,052	1,05	0,008	0,56	0,001 c	1,89
3	0,011	-0,20	0,124	-1,63	0,018	-0,03	0,006	0,84	-0,051 a	2,59	0,007	0,47	-0,005	0,68	-0,005	0,49	0,001	0,93	-0,016 c	1,86
4	-0,065 b	2,11	0,000	0,52	0,024	-0,53	0,014	-0,39	-0,012	1,46	-0,014	1,32	-0,028 c	1,71	-0,026	0,78	0,000	0,39	0,007	0,00
5	-0,059 b	2,03	0,005	-0,04	0,010	-0,16	-0,007	1,36	-0,012	1,63	0,009	-0,50	0,000	0,62	0,026	-0,68	0,010	0,89	0,006	0,74
6	-0,155 b	2,38	-0,020	1,23	-0,025 b	2,48	0,003	0,15	-0,063	1,16	0,008	-0,23	-0,005	0,65	-0,042	1,29	0,001	1,27	-0,011 c	1,84
7	-0,032 c	1,71	-0,010	0,84	0,022	-1,19	-0,004	1,45	-0,053	1,52	-0,002	1,42	0,000	0,60	0,026	-0,70	0,002	1,14	0,005	0,24
8	0,037	-1,02	-0,020	1,21	-0,011	0,92	0,015	-0,58	0,066	-1,45	0,000	1,04	0,005	0,04	0,031	-1,08	-0,005 b	2,31	0,015	0,03
9	0,075	-1,58	0,035	-1,21	0,004	0,68	-0,022 b	2,19	-0,017	0,56	-0,004	1,34	0,014	-0,94	0,016	-0,65	-0,003 b	2,17	-0,003	1,00
10	-0,086 b	2,27	-0,035 c	1,74	0,010	0,62	0,006	-0,26	0,037	-1,60	0,006	0,49	-0,005	0,70	-0,052	1,55	-0,016 a	3,71	0,013	-0,60
11	0,069	-1,55	0,005	-0,07	0,013	0,37	0,008	0,29	-0,024	1,54	-0,005 c	1,85	0,005	0,09	0,042	-1,10	0,001 b	2,03	0,033	-0,18
12	-0,022	1,50	0,020	-0,73	-0,021 a	2,61	0,002	0,35	0,002	0,92	0,000	1,09	-0,005	0,73	0,016	-0,33	0,017	-0,24	0,008	0,75
13	-0,070 b	2,16	-0,005	0,60	-0,007	1,46	0,006	0,71	0,036	-1,03	-0,008	1,30	0,014	-1,00	-0,005	0,54	-0,009 b	2,21	0,001	0,81
14	0,027	-0,78	-0,015	1,18	0,029	-1,63	0,005	0,49	-0,025 b	2,12	0,014	-0,01	-0,009	1,42	-0,005	0,52	-0,006	1,30	0,012	0,20
15	0,010	-0,09	-0,020	1,26	0,092	-0,73	0,021	-1,22	-0,022	1,05	-0,008 c	1,76	0,005	0,07	0,005	-0,07	0,000	1,51	0,013	-0,44

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: NFP – Nonfarm Payrolls, PMI – Purchasing Managers' Indices from Manufacturing and Non-Manufacturing Sectors reported by ISM, Retail Sales, GDP – gross domestic product, Ind. Prod. – industrial production, Core DGO – Core Durable Goods Orders, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 5: Effect of Macroeconomic Announcements on Abnormal Returns of PLN/USD

A: Good News

Time	NFP (30)		PMI Man (31)		PMI Non-Man (30)		Retail Sales (18)		GDP (7)		Ind. Prod. (23)		Core DGO (20)		Trade Bal. (24)		CPI (16)		PPI (16)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,001	0,31	0,005 c	1,83	-0,005 a	3,31	-0,002 a	2,67	0,020	-1,74	0,001 c	1,66	-0,001 a	3,13	-0,006 a	3,76	-0,003 b	2,17	0,003	0,81
-4	0,009	0,82	0,004	1,58	-0,005 b	2,44	0,000	1,44	0,013	-1,60	-0,001	0,82	-0,012 a	3,95	-0,005 a	2,89	-0,016 a	4,11	-0,008 a	3,38
-3	0,016	1,92	-0,005 a	3,06	0,007	0,34	0,004	1,17	-0,003	1,42	-0,002 b	2,49	-0,009 a	3,26	0,003	0,55	-0,006 a	2,89	0,009	-0,37
-2	0,006	0,12	-0,003 a	3,66	0,001	1,29	0,005	-0,06	-0,011 b	2,43	0,001 c	1,89	-0,001	1,64	-0,002 c	1,69	-0,006 b	2,50	0,007	-0,26
-1	-0,194 a	0,00	-0,001 a	4,06	-0,033 a	5,11	-0,058 a	6,21	-0,103 b	2,02	0,008	-0,31	-0,027 a	3,16	-0,026 a	4,88	0,058	-3,10	0,043	-2,56
0	-0,037	0,24	-0,006 a	3,12	0,006 c	1,81	-0,010 b	2,07	-0,007	1,30	0,004	0,41	-0,007 b	2,25	0,013	0,25	-0,009 b	2,24	-0,014 c	1,83
1	0,000 b	0,03	0,005	0,85	-0,012 a	4,38	0,029	-1,07	0,003	1,61	0,007	0,13	0,024	-1,32	0,005	1,46	0,004	0,67	0,004	0,87
2	0,008	0,11	0,003	0,99	0,000 a	2,64	0,003	1,25	0,016	-0,30	0,011	0,11	-0,004 b	2,56	-0,024 a	3,12	-0,007 b	2,24	0,015	-0,18
3	-0,013 b	0,01	0,003	1,08	-0,001	0,90	-0,014 b	2,45	0,012	1,13	-0,001	1,47	0,003	1,37	0,000	1,06	-0,001	1,37	0,007	0,45
4	0,000 b	0,05	-0,019 a	5,23	-0,002 c	1,79	0,008	0,00	-0,003	0,94	0,004	1,56	-0,026 a	4,58	-0,005	1,07	-0,004	1,21	-0,001 c	1,65
5	-0,016 a	0,00	0,008	0,95	-0,003	1,03	-0,002 b	2,28	0,009	-0,27	0,009	0,60	-0,004	1,47	-0,013 b	2,17	-0,014 c	1,79	-0,003 c	1,89
6	0,002	0,26	0,000 a	2,63	-0,003 b	2,24	0,022	-1,20	0,002	1,29	-0,008 a	3,04	0,005	1,06	-0,008 a	3,82	0,003	1,61	-0,002	1,61
7	0,002	0,13	0,018	-1,38	-0,016 a	3,85	0,005	1,36	0,023	-1,24	0,003 c	1,77	0,010	0,77	-0,002	1,40	0,002	0,93	0,000 c	1,77
8	0,003 c	0,09	0,007	1,15	0,011	1,07	0,013	0,47	0,001	1,45	-0,004	1,20	-0,003 c	1,79	-0,005 b	2,09	-0,013 a	2,81	0,005	0,84
9	-0,015 a	0,00	-0,011 a	3,23	0,001 b	2,26	0,011	0,58	0,006	0,70	0,000 a	2,62	-0,002	1,29	-0,005 b	2,54	0,003	0,19	0,027	-2,16
10	-0,018 a	0,00	0,003 c	1,69	-0,005 a	3,30	-0,006 a	2,58	0,021	-1,37	-0,009 a	3,79	-0,007 a	3,37	-0,002	1,55	0,003	0,82	0,000 c	1,68
11	0,010	0,27	0,008	1,13	0,002 b	2,46	0,016	-1,35	0,007	0,63	-0,009 b	2,37	0,000 c	1,71	-0,017 a	2,74	0,006	0,02	-0,016 a	3,12
12	0,007	0,61	-0,016 a	3,52	0,004	1,43	0,006 c	1,77	0,001	1,38	-0,004 c	1,95	-0,002	1,46	0,002	1,10	-0,008 a	2,65	0,011	0,17
13	-0,002 b	0,02	-0,007 a	3,23	0,000	1,61	0,001	1,43	-0,001	1,48	0,004	1,13	-0,003	1,33	0,014	-0,41	-0,012 a	3,06	-0,006 a	3,44
14	-0,016 a	0,00	0,000	1,52	0,010	-0,02	-0,003	1,38	-0,001	1,14	0,000	1,24	-0,002	1,54	-0,012 a	2,61	0,008	0,23	0,002	0,40
15	0,003	0,29	0,007	0,48	0,001 c	1,90	0,010	0,36	0,008	0,40	-0,009 a	2,94	0,008	0,15	0,007	1,28	-0,007 b	2,42	-0,004 b	2,08

B: Bad News

Time	NFP (29)		PMI Man (28)		PMI Non-Man (26)		Retail Sales (24)		GDP (11)		Ind. Prod. (31)		Core DGO (38)		Trade Bal. (26)		CPI (5)		PPI (17)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,000	0,62	-0,006 a	3,21	-0,004 b	1,96	0,001 b	2,27	0,008	-0,20	-0,003 b	2,06	0,001 c	1,89	0,007	-0,31	0,007	-0,48	-0,008 a	2,74
-4	-0,014 a	6,05	-0,006 a	3,42	0,003	0,51	-0,002	1,47	0,009	-0,60	-0,007 a	3,85	0,003	1,07	-0,007 a	3,50	0,006	-0,21	0,000	0,39
-3	0,003 a	3,14	0,001	1,03	0,010	0,58	0,009	-0,34	0,004	0,54	-0,006 a	2,84	0,005	0,90	-0,007 a	3,50	0,001	0,50	-0,010 a	2,65
-2	0,008	-0,19	0,005	0,92	0,010	-0,12	0,000 b	2,41	-0,008 c	1,77	-0,009 a	3,75	0,004	1,47	-0,008 a	3,75	0,004	-0,34	0,002	1,00
-1	0,172	-1,56	0,025	-1,33	0,044	-2,26	0,091	-0,78	0,023	0,97	-0,002	0,91	0,018	1,48	0,016	-1,38	-0,086 a	5,23	-0,020 a	4,43
0	-0,020 a	3,56	0,005	0,30	-0,005 a	2,83	0,013	0,30	0,025	-0,84	0,007	-0,54	0,009	-0,07	-0,006 a	3,97	-0,013 b	2,04	-0,003 c	1,69
1	0,033	-0,27	-0,016 a	4,07	-0,013 a	2,80	-0,012 a	3,83	-0,010 b	2,04	0,007	0,04	0,007	1,06	0,015	0,14	0,029	-0,75	-0,006 b	2,26
2	0,015	1,35	-0,006 c	1,66	0,003	1,05	0,028	-0,41	0,000	0,73	0,003 c	1,81	0,004	1,49	0,017	0,99	-0,023 c	1,88	-0,002 c	1,68
3	0,004 c	1,70	0,007	0,61	-0,005 a	2,83	0,015	0,19	0,006	0,92	0,005	-0,25	0,005 c	1,68	0,013	1,39	0,025	-0,77	0,026	-1,25
4	-0,020 a	3,15	0,013	0,48	-0,009 a	3,00	0,012	0,93	-0,023 a	3,16	0,000 c	1,93	-0,008 a	2,61	0,005	0,45	0,026	0,36	0,007	0,17
5	-0,017 a	3,32	0,003	1,08	-0,014 a	4,22	-0,002 a	2,78	0,006	1,07	0,005	0,30	-0,006 a	2,89	-0,004 a	2,61	0,010	0,52	0,007	0,15
6	0,002 c	1,92	-0,004 b	2,13	0,014	0,18	-0,019 a	3,71	0,008	0,08	0,000 b	2,06	0,002 b	2,53	-0,002 b	2,48	-0,015 b	2,01	-0,011 a	3,66
7	0,000	1,64	-0,008 c	1,90	0,031	-2,38	0,021	-0,74	0,042	-1,56	-0,001 c	1,74	0,002 c	1,89	0,012	0,14	0,007	0,97	0,003	1,44
8	0,011	0,46	-0,003 b	2,55	0,002	1,20	0,001	1,49	-0,005	1,62	0,004	0,71	-0,010 a	4,93	0,002 c	1,94	-0,002	1,36	0,012	0,85
9	0,016	0,43	0,002	1,19	-0,007 a	4,18	0,008	0,89	0,006	0,84	0,011	-0,12	0,005	1,43	0,009	0,53	-0,005 c	1,93	-0,001	1,39
10	0,000 a	3,21	-0,006 a	2,96	0,005	0,93	-0,008 a	2,83	-0,006 b	2,23	0,000	1,33	-0,009 a	5,80	-0,003	1,48	0,006	-0,16	-0,004 b	2,28
11	-0,002 b	2,21	-0,001 b	2,14	-0,002 c	1,85	-0,001 a	2,99	0,010	0,48	-0,002	1,58	-0,007 a	3,02	-0,003 b	2,27	0,016	-0,78	-0,001 b	2,54
12	-0,006 a	3,19	-0,005 b	2,53	0,003 c	1,86	0,000 c	1,71	-0,026 a	3,53	-0,001 b	2,25	0,001 b	2,12	-0,004 a	3,11	-0,004	0,02	-0,002	1,55
13	-0,010 c	1,93	0,003 b	2,19	0,011	0,67	-0,003 a	3,48	0,019	-0,04	0,003 c	1,76	0,003	1,13	-0,001 b	2,46	-0,021 a	2,82	0,002	-0,08
14	0,008	0,76	-0,003 b	2,37	0,002	1,21	0,024	-2,09	0,023	-0,85	-0,005 b	2,25	0,002	1,03	0,003	1,36	0,029	-1,22	0,001	0,23
15	0,006	1,38	-0,007 a	2,67	-0,003 a	2,69	0,007	1,59	0,001	1,27	0,000 a	2,86	0,001 c	1,71	0,003	1,64	0,009	0,27	0,002	0,69

C: Neutral News

Time	NFP (1)		PMI Man (1)		PMI Non-Man (4)		Retail Sales (5)		GDP (2)		Ind. Prod. (5)		Core DGO (1)		Trade Bal. (1)		CPI (18)		PPI (6)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,051 c	-1,34	0,003	0,08	-0,008	1,14	0,008	-0,10	-0,011	0,96	0,014	-0,79	0,058 b	-1,71	-0,018	1,05	-0,001	1,08	-0,005	2,21
-4	0,000	0,35	0,030 c	-1,49	0,021	0,20	0,004	0,94	0,007	-0,05	0,004	1,10	0,009	-0,84	-0,033	1,71	-0,001	1,16	-0,016	2,95
-3	-0,127	2,40	0,000	0,44	0,023	-1,18	0,015	-1,28	0,008	0,02	0,013 b	-1,68	0,024 c	-1,53	-0,125	2,40	0,007	-0,56	-0,011	2,43
-2	0,036	-1,08	-0,036	2,16	0,024	-1,26	0,012	-0,05	0,028 c	-1,50	-0,010	2,08	-0,006	1,11	0,012	-0,52	0,003	1,60	0,011	-0,93
-1	0,115 c	-1,61	-0,010	1,22	-0,004	0,25	0,014	2,06	-0,084	2,93	0,000	0,21	-0,025	2,19	-0,042	2,03	-0,071	4,49	-0,019	2,50
0	-0,049	2,16	0,017	-0,84	0,009	-0,11	-0,003	-0,79	0,018	-0,75	0,007	0,50	-0,009	1,31	0,015	-0,68	0,000	-0,17	0,015	-0,35
1	0,042	-0,28	0,007	0,28	0,007	0,28	0,020	-0,33	-0,046	2,21	0,005	-0,58	0,052 c	-1,58	-0,077	1,84	-0,026	2,63	0,021	-0,22
2	-0,155	1,53	0,000	0,60	0,060 c	-1,50	-0,006	1,48	0,077 b	-1,86	0,006	-0,21	0,055 c	-1,61	0,017	-0,07	0,013	0,25	0,018	1,30
3	-0,034	0,60	0,036	-0,92	0,009	-0,08	0,028	-0,52	-0,053	1,93	0,016	-0,68	0,027 c	-1,42	-0,071	1,53	0,003	0,62	-0,021	1,95
4	-0,037	0,68	0,062 c	-1,42	0,017	-0,08	0,003	0,46	-0,007	1,03	-0,013	1,09	0,024 c	-1,29	0,012	-0,33	-0,001	0,75	0,017	-0,76
5	-0,061	0,94	-0,003	0,62	0,037 b	-2,02	0,001	0,98	-0,026	1,48	0,013	-0,77	-0,025	1,61	-0,071	1,69	0,009	0,34	-0,005	1,38
6	-0,027	0,62	0,000	0,57	-0,031	2,63	-0,007	1,30	-0,053	1,61	0,015 c	-1,51	0,021	-1,26	-0,045	1,47	0,006	0,79	-0,019	1,92
7	-0,033	0,65	-0,010	0,73	0,015	-0,50	-0,008	1,41	-0,035	0,86	0,004	-0,08	0,000	0,09	0,038	-1,18	0,004	0,88	0,000	0,49
8	0,003	0,25	-0,020	1,47	0,007	0,17	0,037 b	-1,67	0,051 c	-1,41	-0,007	1,74	-0,025	1,87	0,062 c	-1,50	-0,007	2,62	0,015	-0,02
9	-0,121	1,55	0,033	-1,10	-0,006	1,01	-0,010	1,35	-0,032	1,48	-0,009	0,84	-0,009	0,97	0,003	0,09	-0,006	1,82	0,007	0,27
10	0,012	-0,01	-0,016	1,45	0,055 b	-2,28	-0,009	0,45	0,033	-0,28	0,013	-0,94	-0,009	1,26	-0,048	1,37	-0,007	2,50	0,011	-0,25
11	0,244 c	-1,42	0,003	0,31	-0,006	1,14	0,003	0,26	-0,027	0,98	-0,001	0,86	0,003	0,01	0,041	-0,84	0,005	1,16	0,032	-1,02
12	-0,088	1,58	0,023	-0,52	-0,014	2,11	-0,005	1,72	0,012	0,32	0,012	-1,16	0,009	-0,68	0,032	-1,08	0,011	0,32	0,018	-0,50
13	-0,127	1,98	-0,010	0,76	0,004	1,13	0,000	0,71	0,016	-0,06	-0,006	1,49	-0,006	0,94	0,035	-1,05	-0,011	2,44	-0,006	1,74
14	0,000	0,28	-0,010	1,13	0,001	1,15	0,005	0,33	0,006	0,11	-0,012	0,91	-0,034	1,98	0,050	-1,21	-0,008	1,26	0,016	-0,28
15	0,027	-0,25	-0,020	1,50	-0,005	1,57	0,021	-0,97	-0,018	0,96	-0,008	1,03	0,003	0,07	-0,045	1,55	-0,002	1,30	0,006	0,27

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: NFP – Nonfarm Payrolls, PMI – Purchasing Managers' Indices from Manufacturing and Non-Manufacturing Sectors reported by ISM, Retail Sales, GDP – gross domestic product, Ind. Prod. – industrial production, Core DGO – Core Durable Goods Orders, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 6: Effect of Macroeconomic Announcements on Abnormal Returns of HUF/USD

A: Good News

Time	NFP (30)		PMI Man (31)		PMI Non-Man (30)		Retail Sales (18)		GDP (7)		Ind. Prod. (23)		Core DGO (20)		Trade Bal. (24)		CPI (16)		PPI (16)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	-0,001	0,83	-0,002 a	3,12	0,002	1,32	-0,003 b	2,18	0,022	-0,35	0,001 c	1,89	-0,004 a	3,56	0,000 c	1,66	-0,008 a	2,76	-0,011 a	3,81
-4	0,012	-0,58	0,005	0,43	-0,004 b	2,19	0,001	1,62	0,016	-1,34	0,003	1,17	-0,008 a	3,63	-0,001 b	2,11	-0,023 a	5,46	-0,003 b	2,25
-3	0,015	-1,33	0,001 b	2,23	0,004	0,88	0,007	0,56	-0,014 c	1,76	-0,005 b	2,18	-0,008 a	2,79	0,007	-0,24	-0,006 b	2,39	0,011	-0,54
-2	-0,016 a	3,04	-0,006 a	3,39	-0,002 b	2,19	0,007	-0,15	-0,019 a	3,93	0,005	0,24	-0,006 a	2,78	0,002	1,54	0,008	0,26	-0,002	1,27
-1	-0,186 a	4,72	0,000 b	2,16	-0,030 a	4,16	-0,058 a	5,40	-0,062	1,09	0,000	1,48	-0,039 a	3,76	-0,022 a	2,95	0,038	-2,34	0,050	-3,44
0	-0,044 a	3,23	-0,005 a	3,61	-0,009 a	3,50	0,003 b	2,25	-0,046 b	2,00	-0,001 b	2,55	0,000	1,02	0,018	-1,19	-0,012 b	2,43	0,000	0,97
1	0,000 a	2,72	0,004	0,95	-0,017 a	5,41	0,004	0,55	0,002	1,52	0,005	0,24	0,030	-2,31	0,000	1,32	-0,010 c	1,85	0,000	1,25
2	-0,001 b	2,31	0,014	-0,40	-0,015 a	4,73	0,009	0,31	0,015	0,26	0,009	0,43	-0,006 a	2,92	-0,017 a	2,86	0,012	0,73	0,006	1,10
3	-0,004 c	1,76	0,000	1,49	0,003	-0,10	-0,011 b	2,15	-0,011 c	1,83	0,011	-1,47	0,005	0,54	-0,006 b	2,43	0,002 c	1,74	0,008	-0,59
4	-0,013 a	2,80	-0,006 a	2,73	0,001	1,42	-0,001	0,93	0,009	0,12	0,000 c	1,81	-0,017 a	4,29	-0,005	0,89	0,007	0,03	-0,003	1,12
5	-0,014 a	3,17	0,002 b	2,27	-0,003	1,56	0,001	1,40	-0,005	1,21	0,002	1,51	-0,008 b	2,14	-0,020 a	3,03	-0,008 c	1,87	0,004	0,90
6	-0,008 b	2,54	-0,001 a	3,12	-0,005 b	2,38	0,015	0,01	0,004	0,76	0,008	1,18	0,003	0,27	-0,014 a	4,00	0,011	0,55	-0,002	1,30
7	0,010	0,51	0,012	0,54	0,001 c	1,69	0,002	1,02	0,025	-1,05	0,007	0,05	0,003	0,55	0,003	1,55	-0,006 c	1,93	-0,004 b	2,16
8	-0,008 b	2,43	0,008	0,53	0,008	0,76	0,019	0,17	0,007	0,27	0,004	0,54	-0,001 b	2,08	0,001	1,41	-0,008 b	2,44	0,016	-0,93
9	-0,023 a	3,48	-0,009 a	3,49	0,004 c	1,89	-0,006 c	1,75	-0,005 c	1,89	-0,003 a	2,67	-0,004 b	2,38	-0,009 b	2,38	0,005	0,18	0,011	-0,89
10	-0,005 b	2,24	0,005 c	1,86	-0,003 b	2,51	-0,004 c	1,76	0,036	-1,16	-0,009 a	3,84	-0,003 c	1,92	0,008	0,05	-0,004 c	1,91	0,008	0,01
11	0,001 c	1,89	-0,001 b	2,27	0,000 a	3,00	0,019	-1,13	0,016	-0,78	0,001	1,23	0,004	0,93	-0,020 a	2,90	0,010	-0,09	-0,010 b	2,43
12	0,004	0,87	-0,018 a	4,55	-0,001	1,57	0,008	1,28	0,013	-0,43	-0,010 a	4,18	0,004	0,04	0,002	1,30	-0,002 b	2,54	0,006	0,11
13	-0,004 a	3,05	-0,007 a	3,15	-0,004 a	2,71	0,007	0,34	0,005	0,73	0,002	0,82	-0,001 c	1,94	0,010	0,00	-0,011 a	2,59	0,000	1,50
14	-0,022 a	5,45	0,007	-0,44	0,008	-0,38	0,000	1,25	-0,014 c	1,91	0,001	0,89	0,001	1,48	-0,015 b	2,51	0,016	-0,82	0,001	1,04
15	-0,001	1,29	0,014	0,26	-0,004 a	3,64	0,024	-0,86	0,005	0,67	-0,006 a	2,60	0,010	-0,40	0,004	0,67	-0,007 b	2,18	-0,006 b	2,12

B: Bad News

Time	NFP (29)		PMI Man (28)		PMI Non-Man (26)		Retail Sales (24)		GDP (11)		Ind. Prod. (31)		Core DGO (38)		Trade Bal. (26)		CPI (5)		PPI (17)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,004	0,14	-0,001 b	2,33	-0,008 b	2,07	0,000	1,61	-0,002 c	1,89	-0,002 a	2,59	0,001 b	2,20	0,005	0,81	-0,001	1,54	-0,006 a	3,54
-4	-0,013 a	4,61	0,003	1,35	0,012	-0,13	-0,008 a	2,96	-0,001	1,04	0,000 b	2,09	0,001 b	2,16	-0,007 a	4,02	0,008	-0,93	0,007	0,37
-3	0,006 b	2,02	0,008	0,14	0,002 b	2,00	0,012	-1,14	0,000	-1,30	-0,007 a	3,14	-0,002 b	2,26	-0,004 a	2,77	0,002	0,62	-0,003	1,39
-2	0,002	1,46	0,005 b	2,42	0,016	-0,17	-0,006 a	3,10	-0,005 b	2,56	-0,013 a	2,99	0,008	-0,16	-0,014 a	5,19	-0,005	1,52	-0,011 b	2,39
-1	0,133	-1,50	0,029	-0,94	0,047	-4,01	0,079	-0,66	-0,023	0,89	-0,001	1,51	0,025	0,19	0,020	-1,12	-0,077 a	4,96	-0,023 a	4,44
0	0,000 a	3,65	0,004	1,09	-0,009 a	2,80	0,013	0,31	0,004	0,49	0,005	1,01	0,010	-0,27	-0,004 a	3,17	-0,012 c	1,86	0,003	0,72
1	0,044	-0,88	-0,008 a	2,98	0,004	1,05	-0,010 a	3,44	0,003	0,24	0,002 b	2,13	0,002	1,55	0,019	-0,44	0,020	-0,05	0,004	0,98
2	0,020	1,20	-0,007 b	2,43	0,004	0,87	0,031	-0,21	-0,012 b	2,30	0,006 c	1,88	0,000	1,63	0,011 c	1,71	-0,009	1,29	0,006	1,32
3	0,010 b	2,07	-0,001	1,25	-0,005 b	1,97	0,005	1,45	-0,002 b	1,96	0,007	-0,19	0,001 b	2,32	0,019	1,15	0,028	-1,10	0,013	-0,47
4	-0,034 a	4,28	0,012	0,13	0,006	1,07	0,015	0,80	-0,009 a	2,79	0,007	1,44	-0,004 c	1,86	0,007	0,73	0,031	-0,66	0,015	-0,74
5	-0,013 a	2,87	0,020	-0,09	-0,023 a	6,05	0,013	0,85	-0,007 b	2,26	0,000	1,07	-0,008 a	3,23	-0,014 a	4,06	0,002	0,39	0,002	0,97
6	0,008	0,78	-0,001 b	1,99	0,010	1,19	-0,016 a	3,53	0,001	0,99	0,007	1,03	0,002 b	2,48	-0,003 a	2,93	0,012	-0,14	-0,009 a	3,03
7	0,008	1,08	0,000 b	2,13	0,031	-2,04	0,014	0,77	0,006	-0,91	-0,006 a	3,57	0,001	1,40	0,008	0,83	0,013	0,15	0,008	1,09
8	0,002 c	1,75	-0,001 b	2,51	0,010	0,40	-0,002 a	2,58	-0,007 b	2,52	0,004	1,00	-0,007 a	4,62	0,013	1,06	-0,013 b	2,17	0,003	0,54
9	0,023	-0,42	0,009	1,14	-0,007 a	3,26	0,011	0,57	-0,006 b	2,22	0,013	-0,73	0,005	0,47	0,009	0,73	-0,005	1,51	0,009 c	1,69
10	-0,004 a	2,66	-0,005 a	2,96	0,001	1,32	-0,004 c	1,87	-0,006 a	3,44	0,002 b	2,11	-0,010 a	4,85	-0,002 c	1,72	0,012	-0,28	-0,005 a	2,71
11	0,003	1,39	-0,011 a	4,08	-0,001 b	2,03	0,003 c	1,84	0,010	-1,35	0,000	1,49	-0,013 a	4,11	-0,007 b	2,33	0,009	-0,20	-0,007 b	2,11
12	-0,001 b	2,54	0,009	1,60	-0,012 a	3,64	0,005 c	1,81	0,000	0,99	-0,004 a	2,91	-0,006 a	4,17	0,005	1,21	0,000	0,24	-0,003 c	1,86
13	0,002 c	1,82	0,003	1,57	0,004 b	2,35	-0,011 a	3,29	-0,005 a	2,91	-0,003 a	2,72	0,004	0,73	-0,005 b	2,16	-0,006	1,31	0,001	0,78
14	0,002 c	1,80	-0,012 a	3,05	0,007	1,08	0,017	-1,40	-0,008 b	2,14	0,002 b	2,26	0,002	1,13	0,003	1,41	0,029	-1,19	0,004	0,16
15	0,009	0,84	-0,001 c	1,83	-0,007 a	3,39	-0,005 a	2,90	0,001	1,30	-0,011 a	2,96	0,004 b	2,05	0,000	1,60	0,006	0,53	-0,003 c	1,84

C: Neutral News

Time	NFP (1)		PMI Man (1)		PMI Non-Man (4)		Retail Sales (5)		GDP (2)		Ind. Prod. (5)		Core DGO (1)		Trade Bal. (1)		CPI (18)		PPI (6)	
	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q	AR %	Tcz Q
-5	0,040	-1,08	0,001	0,45	-0,030 b	2,55	0,006	0,11	-0,047 b	2,52	0,008	-0,34	-0,012	1,47	-0,022	1,45	-0,006 a	3,37	-0,011 b	1,98
-4	-0,063 b	2,19	0,037	-1,47	0,038	-1,20	0,015	-0,65	-0,021 b	2,06	-0,007 c	1,80	0,029	-1,45	-0,026	1,61	0,006	-0,04	-0,014 b	2,32
-3	-0,009	0,81	-0,009	1,31	-0,002	-0,38	0,000	0,38	0,020	-0,95	0,027	-3,02	0,110	-1,71	-0,088 b	2,32	-0,001 c	1,80	-0,011 a	2,58
-2	-0,018	1,29	-0,027 c	1,84	0,007	-0,25	0,006	0,48	0,040	-1,63	0,004	0,05	0,000	0,36	0,035	-1,26	-0,003	1,57	-0,014	1,18
-1	0,364	-1,71	-0,036 b	2,08	0,013	-0,08	0,002 b	2,40	-0,106 a	2,82	-0,007 c	1,86	0,000	0,36	-0,048 b	2,11	-0,053 a	4,85	0,020	0,43
0	-0,095 b	2,32	0,028	-1,23	0,024	-0,19	-0,010	1,62	0,033	-1,45	0,007	-0,37	0,000	0,36	0,061	-1,61	-0,016	1,35	0,018	-0,18
1	-0,018	0,44	0,023	-0,76	-0,005	0,84	0,049	-1,29	-0,058 b	2,03	0,001	0,52	0,000	-0,01	-0,105 b	2,19	-0,026 a	2,77	0,018	-0,07
2	-0,171	1,63	0,005	0,31	0,031	-1,00	-0,006	1,31	0,077	-1,76	-0,002	1,37	0,000	-0,04	-0,074	1,39	0,008	0,82	0,003 b	2,15
3	-0,041	0,57	0,046	-1,13	0,037	-0,69	0,028	-1,45	-0,039 c	1,78	-0,004 b	2,06	0,008	-0,60	-0,004	0,49	-0,001 c	1,71	-0,014 b	2,15
4	-0,095	1,31	0,037	-1,10	0,026	-0,27	0,001	0,35	0,018	-0,17	0,002	0,48	0,004	-0,09	-0,013	0,78	-0,002	1,14	0,004	-0,10
5	-0,005	0,36	0,001	0,62	0,023	0,05	-0,008	1,32	0,007	0,23	0,006	0,48	-0,004	0,62	0,013	-0,23	0,012	0,45	0,010	1,14
6	-0,014	0,46	-0,036 c	1,82	-0,022 b	2,22	0,018	-0,27	-0,062	1,28	0,028	-2,02	0,000	0,04	-0,039	1,53	0,008	0,74	-0,011 c	1,78
7	-0,041	0,84	0,005	0,28	0,024	-1,30	0,019	-0,04	0,003	0,30	-0,008 b	2,25	0,045	-1,53	0,013	-0,20	0,002	1,29	-0,015 a	2,70
8	0,008	0,12	0,010	-0,07	-0,010	1,10	0,005	0,54	0,053	-1,41	0,006	0,01	0,012	-0,94	0,035	-0,94	-0,011 a	4,02	0,010	0,29
9	-0,104	1,50	0,019	-0,49	-0,002	1,09	-0,019	1,47	0,007	0,36	-0,014 c	1,81	-0,008	1,15	-0,013	0,81	0,002 b	2,20	0,005	0,13
10	-0,005	0,38	-0,027	1,61	0,015	0,20	0,005	0,07	0,095	-1,75	0,017	-0,79	0,020	-1,26	-0,048	1,55	-0,010 b	2,43	0,006	0,47
11	0,080	-0,73	-0,018	1,58	0,011	-0,12	0,001	0,92	-0,014	0,88	0,000	0,18	0,012	-0,92	0,039	-0,92	0,005 b	2,00	0,025	-0,25
12	-0,032	0,89	0,001	0,65	-0,009	1,53	0,000	0,87	0,003	0,49	-0,001	0,80	0,000	0,09	0,022	-0,54	0,008	0,01	0,010	-0,05
13	-0,153 b	2,00	0,010	-0,09	-0,008	1,26	-0,004	0,83	0,011	0,17	-0,004 c	1,76	0,008	-0,62	0,009	-0,17	-0,013 a	4,12	-0,001	1,08
14	0,049	-0,76	0,060	-1,50	0,032	-2,00	-0,012	1,18	0,016	-0,04	0,013	-0,27	0,000	0,01	0,004	0,20	-0,002	0,84	0,018	-0,24
15	0,008	0,15	-0,022	1,55	-0,007	1,43	0,015	-0,46	-0,021	1,14	0,001	0,56	0,000	0,07	0,000	0,23	0,007	-0,21	0,019	-0,04

Note: Tables contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: NFP – Nonfarm Payrolls, PMI – Purchasing Managers' Indices from Manufacturing and Non-Manufacturing Sectors reported by ISM, Retail Sales, GDP – gross domestic product, Ind. Prod. – industrial production, Core DGO – Core Durable Goods Orders, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table 7: Response of currencies to qualitatively different news: Comparison based on the Kruskal-Wallis test

Panel A1: Exchange rates of local currencies denominated in Euro, first minute after the news announcement

	Good News		Bad News		Neutral News	
	KW	P value	KW	P value	KW	P value
ZEW	4,935 [c]	0,085	4,073	0,131	2,000	0,368
PMI	2,759	0,252	0,258	0,879	-	-
IFO	2,853	0,240	4,638 [c]	0,098	2,000	0,368
Ind. Prod.	1,731	0,421	0,486	0,785	1,156	0,561
GDP	1,675	0,433	1,477	0,478	1,038	0,595
Retail Sales	5,504 [c]	0,064	0,418	0,811	1,098	0,577
Trade Bal.	1,562	0,458	3,420	0,181	0,857	0,651
CPI	0,796	0,672	3,435	0,180	7,311 [b]	0,026
PPI	3,495	0,174	3,819	0,148	2,077	0,354

Note: Symbols b and c denote statistical significance at the 5 and 10% levels, respectively.

Panel A2: Exchange rates of local currencies denominated in Euro, cumulative five minutes after the news announcement

	Good News		Bad News		Neutral News	
	KW	P value	KW	P value	KW	P value
ZEW	1,223	0,54	8,782 [b]	0,01	2,000	0,37
PMI	2,238	0,33	1,928	0,38	-	-
IFO	1,558	0,46	2,241	0,33	2,000	0,37
Ind. Prod.	2,375	0,31	0,142	0,93	0,089	0,96
GDP	1,312	0,52	0,920	0,63	2,346	0,31
Retail Sales	10,850 [a]	0,00	1,567	0,46	0,052	0,97
Trade Bal.	0,509	0,78	1,370	0,50	3,714	0,16
CPI	1,835	0,40	3,103	0,21	4,718 [c]	0,09
PPI	0,622	0,73	0,541	0,76	0,558	0,76

Note: Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively.

Panel B1: Exchange rates of local currencies denominated in USD, first minute after the news announcement

	Good News		Bad News		Neutral News	
	KW	P value	KW	P value	KW	P value
NFP	0,353	0,838	0,278	0,870	2,000	0,368
PMI Man.	0,412	0,814	0,139	0,933	2,000	0,368
PMI Non-Man.	0,922	0,631	0,091	0,956	0,346	0,841
Retail Sales	0,154	0,926	0,066	0,968	0,320	0,852
GDP	0,230	0,891	3,151	0,207	0,857	0,651
Ind. Prod.	2,726	0,256	1,400	0,497	0,260	0,878
Core DGO	0,481	0,786	0,606	0,739	2,000	0,368
Trade Bal.	0,180	0,914	0,241	0,887	2,000	0,368
CPI	0,004	0,998	0,060	0,970	0,491	0,782
PPI	0,439	0,803	0,879	0,644	0,327	0,849

Panel B2: Exchange rates of local currencies denominated in USD, cumulative five minutes after the news announcement

	Good News		Bad News		Neutral News	
	KW	P value	KW	P value	KW	P value
NFP	0,447	0,80	0,346	0,84	2,000	0,37
PMI Man.	1,023	0,60	0,067	0,97	2,000	0,37
PMI Non-Man.	3,552	0,17	1,059	0,59	0,038	0,98
Retail Sales	0,521	0,77	0,124	0,94	1,260	0,53
GDP	0,742	0,69	0,403	0,82	3,714	0,16
Ind. Prod.	0,039	0,98	0,428	0,81	0,192	0,91
Core DGO	0,728	0,69	0,428	0,81	2,000	0,37
Trade Bal.	0,093	0,95	0,249	0,88	2,000	0,37
CPI	0,823	0,66	0,140	0,93	0,329	0,85
PPI	0,540	0,76	0,259	0,88	0,912	0,63

Table 8: Effect of Monetary Policy on Abnormal Returns
Panel A: Effect of ECB Monetary on Abnormal Returns of CZK/EUR, PLN/EUR, HUF/EUR

Time	CZK/EUR (12)			PLN/EUR (12)			HUF/EUR (12)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,000	c	1,69	0,020		-0,56	0,003	a	3,49
-4	0,003	a	3,56	-0,002	b	2,05	0,001		1,09
-3	0,006		0,64	0,005		0,18	0,003		0,20
-2	-0,002		0,56	-0,016	a	3,18	-0,005		1,39
-1	-0,005	c	1,89	0,013		0,37	0,005	c	1,91
0	0,021		-0,57	0,007		-0,20	0,016		-1,46
1	0,000	a	2,77	0,042		-1,00	0,007		0,47
2	0,007	b	2,30	0,025		-3,00	0,005		-0,21
3	-0,018	a	2,66	0,027		-0,13	0,024		-1,76
4	-0,001	b	2,08	-0,009		1,53	0,000		-0,08
5	0,005		0,95	-0,012	a	3,54	0,018		0,80
6	0,001	a	2,77	0,005		0,17	0,001		0,61
7	0,011		0,38	-0,003	c	1,65	-0,008		1,34
8	0,019		-0,02	-0,004	b	2,51	0,000		0,86
9	0,011		1,40	0,002		0,90	0,024		-0,71
10	0,011	b	2,15	0,024		-1,77	0,004		0,91
11	-0,003	c	1,66	-0,007	b	2,44	0,004		-0,46
12	0,021		0,37	-0,006		1,09	0,027		-0,51
13	-0,005		1,43	0,025		-0,45	0,005		0,20
14	0,008		1,33	-0,007		1,44	-0,010	a	3,33
15	-0,007	a	2,74	-0,008	a	2,71	0,004		-0,14

Note: Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively.

Panel B: Effect of the Fed Monetary Policy on Abnormal Returns of CZK/USD, PLN/USD, HUF/USD

Time	CZK/USD (6)			PLN/USD (6)			HUF/USD (6)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,002		1,11	-0,001		0,08	-0,015	a	2,94
-4	0,002		0,86	0,009		-0,83	0,001		0,18
-3	-0,010		1,54	0,002		0,55	0,009		0,03
-2	-0,032		1,47	-0,019		1,19	-0,002		1,15
-1	-0,002		1,21	-0,064		1,58	-0,076	a	3,16
0	-0,013		0,51	-0,024	c	1,70	-0,049	b	2,19
1	-0,045		1,61	0,010		-0,15	0,015		-0,12
2	0,018		-0,36	0,002		0,76	0,020		0,12
3	0,004		0,54	0,000		0,98	0,020		-0,82
4	0,010		-0,29	0,027		-0,85	-0,007	c	1,67
5	-0,021		0,86	0,000		-0,03	0,024		0,08
6	0,002		0,88	0,031		0,05	0,005		0,52
7	0,004		0,88	0,027		-0,30	-0,005		-0,03
8	0,073		0,02	0,020		0,03	0,013		0,38
9	0,015		-0,12	-0,039	a	2,64	0,017		0,22
10	0,008		0,31	0,027		0,59	-0,008		1,32
11	0,039		-0,04	0,046		-0,36	0,040		-0,25
12	0,001		1,15	-0,005	c	1,71	0,023		-0,88
13	-0,014		1,31	0,001		0,69	-0,019	b	2,36
14	-0,018		0,98	0,005		0,26	-0,008		0,61

Note: Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively

Figure 1: Plots of one-minute spot rates (left) and one-minute percentage returns (right) for the case of CZK/EUR (first row), HUF/EUR (second row), and PLN/EUR (third row) exchange rates. The sample runs from January 3, 2001 to December 31, 2015.

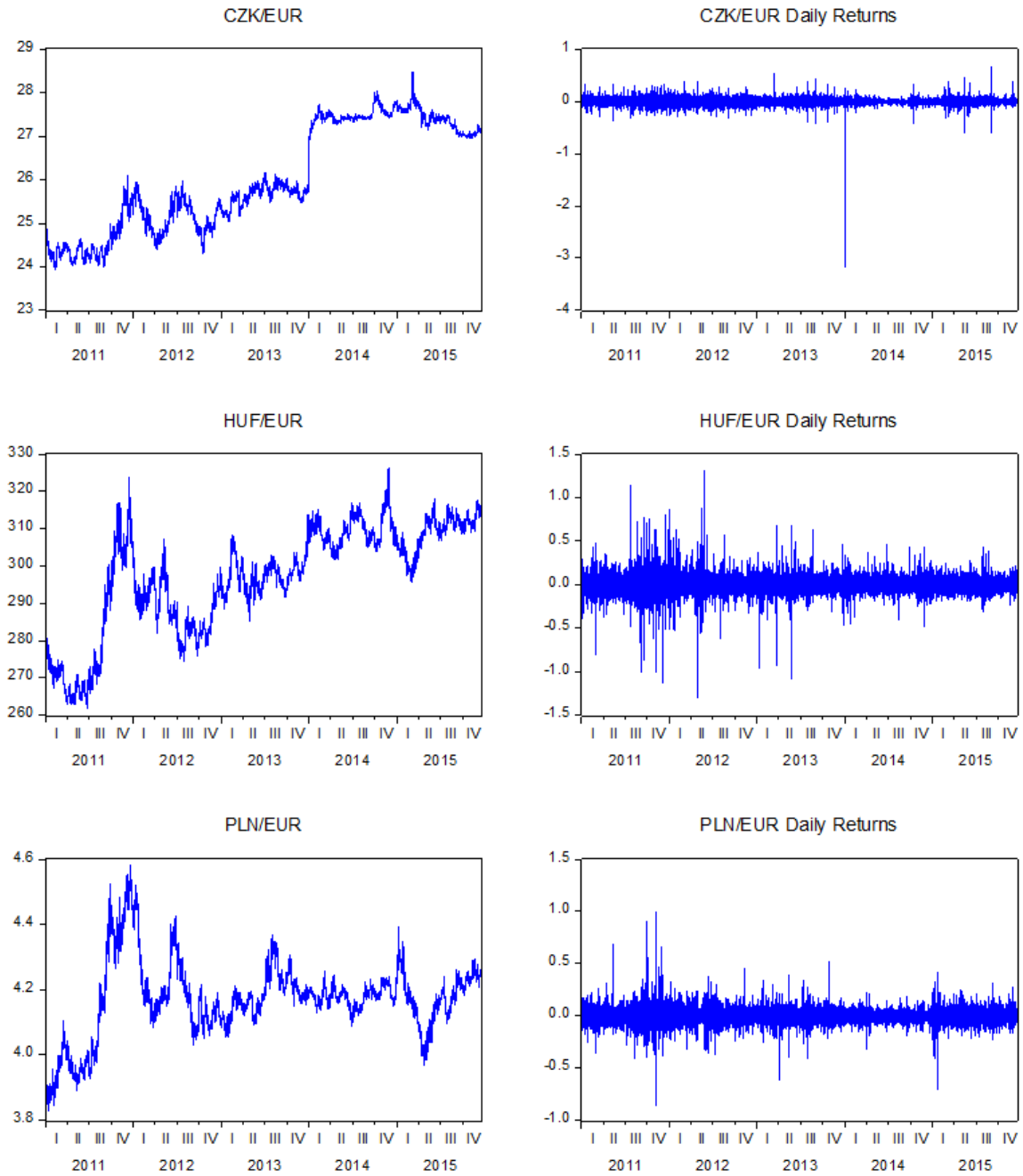


Fig. 2: Plots of one-minute spot rates (left) and one-minute percentage returns (right) for the case of CZK/USD (first row), HUF/USD (second row), and PLN/USD (third row) exchange rates. The sample runs from January 3, 2001 to December 31, 2015.

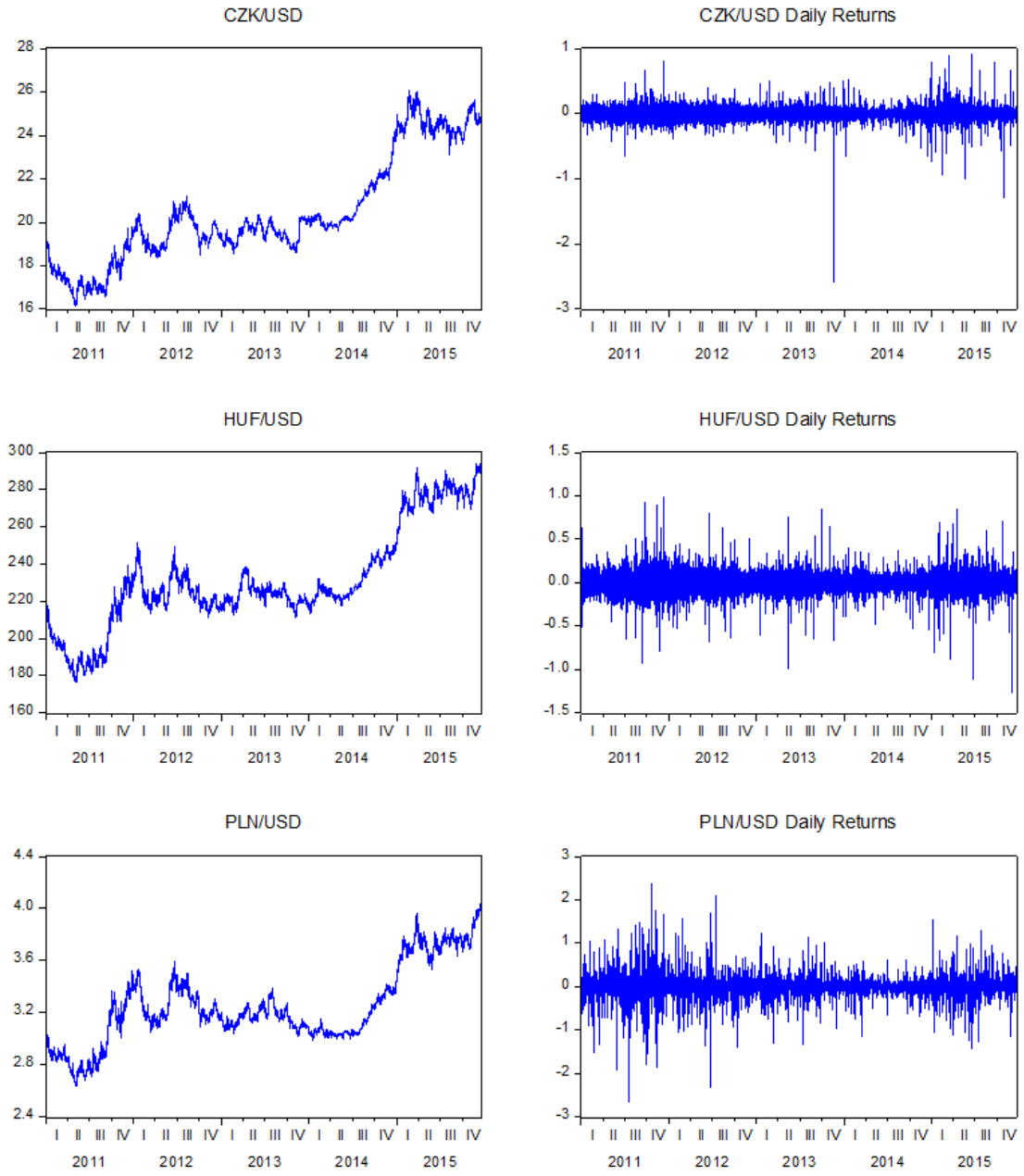


Fig. 3: Time Ranges Used in Event Studies

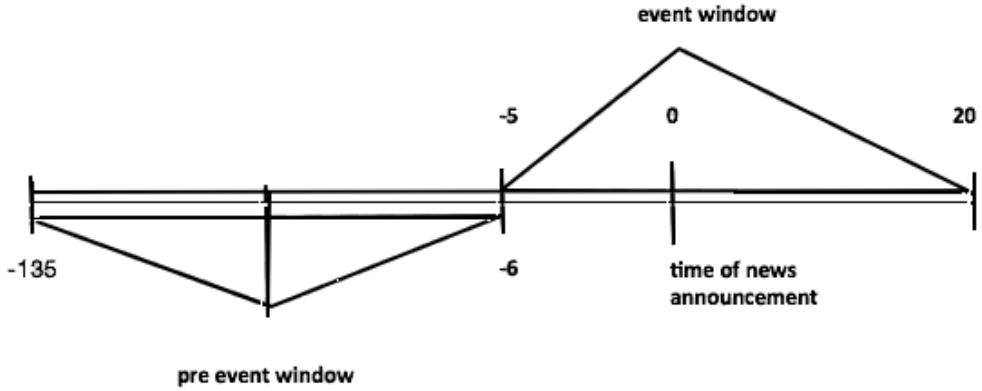
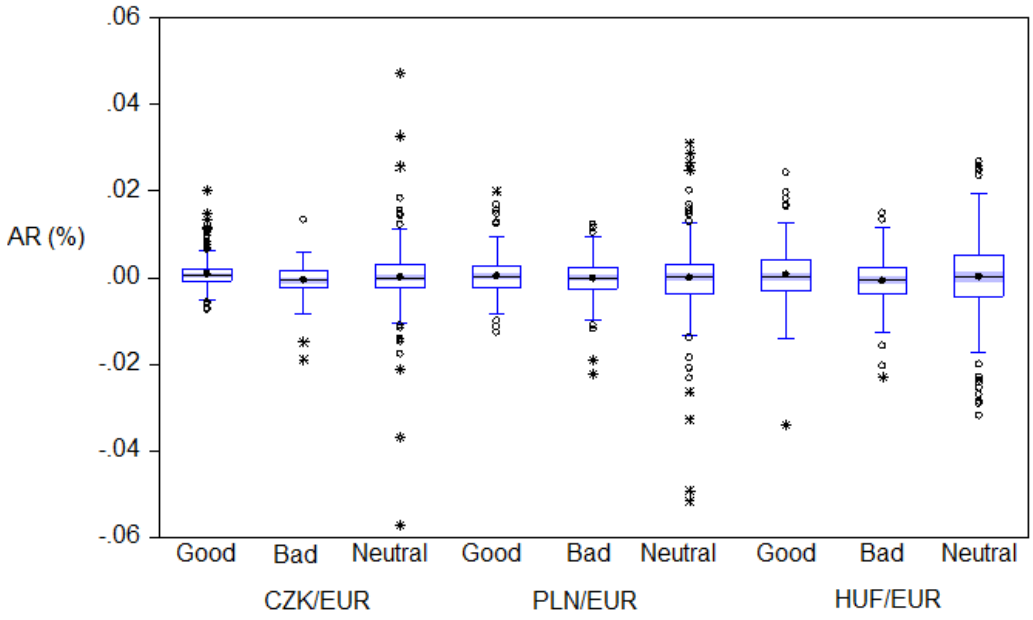


Fig. 4: Box-and-whisker plots of abnormal returns (AR in %) linked to clusters of good, bad, and neutral news

Panel A: Exchange rates of local currencies denominated in Euro



Panel B: Exchange rates of local currencies denominated in the U.S. dollar

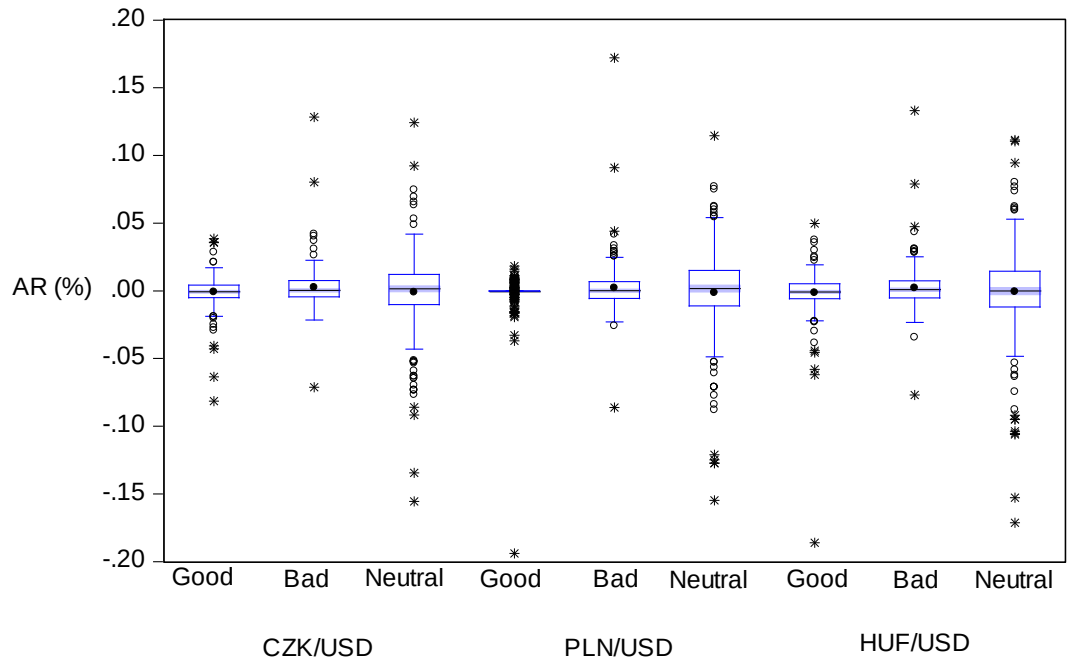
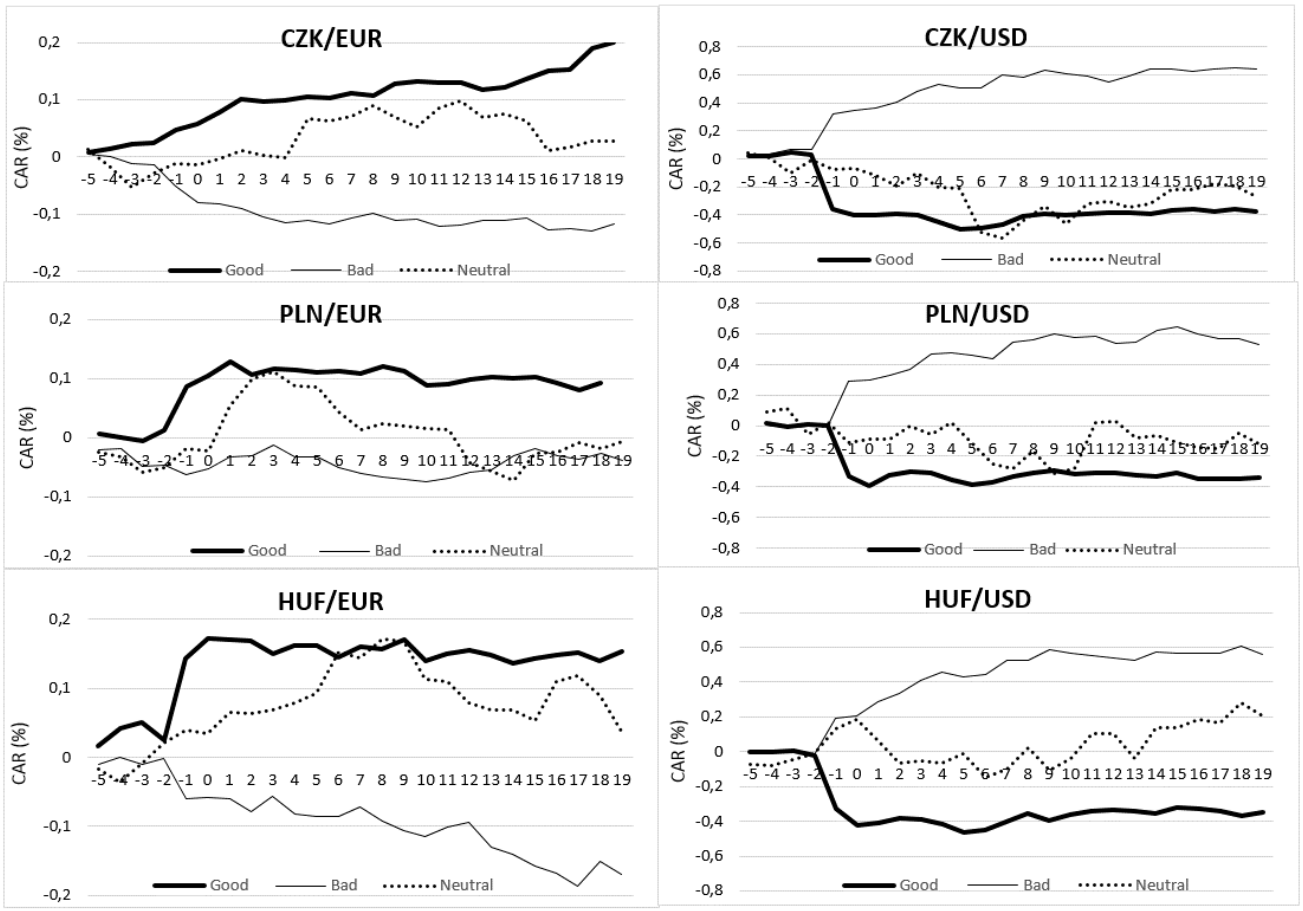


Fig. 5: Cumulative mean abnormal returns (CAR in %) on the currency pairs linked to good, bad, and neutral news



Appendix

Table A1: Examined macroeconomic events
Panel A: Distribution of examined German/Eurozone events

	Good News	Bad News	Neutral News	All
ZEW	24	32	1	57
PMI	13	19	0	32
IFO	31	26	1	58
Ind. Prod.	24	33	3	60
GDP	9	7	4	20
Retail Sales	23	29	7	59
Trade Bal.	23	30	2	55
CPI	21	18	19	58
PPI	24	20	14	58

Panel B: Distribution of examined U.S. events

	Good News	Bad News	Neutral News	All
NFP	30	29	1	60
PMI Man.	31	28	1	60
PMI Non-Man.	30	26	4	60
Retail Sales	18	24	5	47
GDP	7	11	2	20
Ind. Prod.	23	31	5	59
Core GDP	20	38	1	59
Trade Bal.	24	26	1	51
CPI	16	5	18	39
PPI	16	17	6	39

Table A2: Monetary policy settings
Panel A: ECB meetings

Day of the ECB meeting	Time of the announcement	Deposit Interest Rate	Main Refinancing Operations	Marginal Lending Facility
7.4.2011	1:45 p.m. CET	0,50	1,25	2,00
7.7.2011	1:45 p.m. CET	0,75	1,50	2,25
3.11.2011	1:45 p.m. CET	0,50	1,25	2,00
8.12.2011	1:45 p.m. CET	0,25	1,00	1,75
5.7.2012	1:45 p.m. CET	0,00	0,75	1,50
2.5.2013	1:45 p.m. CET	0,00	0,50	1,00
7.11.2013	1:45 p.m. CET	0,00	0,25	0,75
5.6.2014	1:45 p.m. CET	−0,10	0,15	0,40
4.9.2014	1:45 p.m. CET	−0,20	0,05	0,30
22.1.2015	2:30 p.m. CET	QE announcement		
5.3.2015	2:30 p.m. CET	QE details announcement		
3.12.2015	1:45 p.m. CET	−0,30	0,05	0,30

Panel B: FOMC meetings

Date of the FOMC meeting	Time of the announcement	Unconventional monetary policy settings
21.9.2011	8:00 p.m. CET	FOMC meeting with the announcement of operation Twist planning to purchase 400 billion dollars of bonds with maturities of 6 to 30 years and to sell the bond within less than 3 years, thereby extending the average maturity of the Fed's own portfolio.
20.6.2012	8:00 p.m. CET	FOMC announced an extension to the Twist program by adding 267 billion dollars.
13.9.2012	8:00 p.m. CET	FOMC announced the 3rd round of the Quantitative Easing program (QE3) with monthly purchases worth 40 billion dollars of mortgage-backed securities.
12.12.2012	8:00 p.m. CET	FOMC voted to expand its QE program with an additional monthly 45 billion USD of longer-term Treasury securities.
18.12.2013	8:00 p.m. CET	FOMC announced tapering back QE3 purchases at a rate of 10 billion USD each month.
16.12.2015	8:00 p.m. CET	FOMC announced its key interest rate (the Fed Fund rate) increase for the first time after June 2006. The hike was from the range (0%–0.25%) to the range (0.25%–0.5%).

Table A3: Effect of Macroeconomic Announcements on Abnormal Returns of CZK/USD

Time	NFP (60)			PMI Man (60)			PMI Non-Man (60)			Retail Sales (47)			GDP (20)			Ind. Prod. (59)			Core DGO (59)			Trade Bal. (51)			CPI (39)			PPI (40)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,005		0,76	-0,002	a	3,89	0,001	b	2,41	0,003		0,99	0,006		1,51	-0,003	a	3,49	0,005		1,52	0,001	b	2,40	0,002	c	1,74	0,000	b	1,98
-4	0,002	b	2,26	0,001	b	2,39	0,004		1,57	-0,004	a	4,30	0,015		-1,26	0,002	b	2,08	-0,002	a	3,50	-0,005	a	4,71	-0,002	b	2,08	-0,005	a	3,94
-3	0,010		0,89	0,000	b	2,29	0,003	b	2,01	0,007		0,17	0,004		0,90	-0,002	b	2,06	0,000	a	2,60	-0,002	a	3,03	0,003		-0,25	0,005		1,58
-2	-0,003	a	2,99	0,006		0,59	0,008		1,36	0,008	c	1,76	-0,009	a	3,76	-0,013	a	6,56	0,000	a	3,39	-0,007	a	4,95	0,008		-0,69	0,003		1,12
-1	-0,039	b	2,55	0,006	c	1,84	-0,001	c	1,80	0,017	a	3,17	-0,021	b	2,42	0,004		0,43	-0,005	a	2,76	0,000		0,73	-0,033	a	4,53	0,012	b	2,13
0	-0,022	a	4,03	-0,005	a	3,75	-0,002	a	3,83	0,006		0,21	0,021		-1,95	0,004		-0,15	0,002	b	1,96	0,000	b	2,51	-0,005	c	1,91	0,001		-0,18
1	0,005	a	3,32	-0,010	a	4,21	-0,007	a	5,10	-0,004	a	2,61	-0,016	a	4,15	0,003	c	1,69	0,013		-0,83	0,002	a	2,70	-0,004	c	1,86	0,004	b	2,00
2	-0,011	a	4,08	-0,004	b	2,17	0,005	c	1,87	0,012		1,36	0,024		-0,04	0,004		1,42	0,002	a	2,91	0,001	a	2,72	-0,001	b	2,49	0,003	b	2,18
3	0,007	b	2,26	0,008	c	1,76	0,001	b	1,96	0,000	b	2,36	-0,013	a	3,51	0,003		0,91	0,006		1,49	0,010	b	2,11	0,003		1,19	0,007		0,64
4	-0,010	a	5,71	0,000	a	3,15	0,001	a	2,72	0,008		1,50	-0,008	a	2,93	-0,002	a	3,78	-0,008	a	4,24	0,003		1,17	0,003		0,78	0,005		0,21
5	-0,014	a	4,88	0,000	a	3,51	-0,009	a	5,39	0,002	a	2,84	0,002	c	1,69	0,001	a	2,88	-0,005	a	4,37	-0,011	a	4,69	0,003	c	1,83	0,002	b	2,09
6	-0,004	a	2,72	-0,002	a	4,12	0,004	a	3,10	0,000		1,60	-0,001		1,20	0,001	a	3,53	0,003	a	2,63	-0,009	a	4,64	0,004	c	1,94	-0,006	a	3,22
7	-0,002	b	2,29	0,002	b	2,10	0,012		-0,10	0,006		1,39	0,023		-0,58	-0,006	a	5,06	0,005		1,13	0,009		0,68	0,003	b	2,14	-0,001	a	2,82
8	-0,001	a	3,39	-0,004	a	4,13	0,005		1,43	0,004	b	2,02	0,020		0,27	0,005		1,23	-0,006	a	4,81	0,001	b	2,30	-0,009	a	4,52	0,010		0,20
9	-0,001	b	2,29	0,001	a	3,15	0,001	a	3,53	0,008		0,21	0,003		1,50	0,004		1,22	0,004		1,01	0,004	b	2,08	-0,005	a	3,42	0,009		0,58
10	-0,010	a	5,10	0,000	a	3,00	-0,004	a	3,98	0,000	b	2,19	0,008		0,19	0,001	a	3,16	-0,009	a	6,40	-0,005	a	3,47	-0,007	a	3,51	0,002	b	2,34
11	0,002	b	2,27	0,002	a	2,77	-0,001	c	1,89	0,005	b	2,26	0,003		0,74	-0,003	a	3,09	-0,006	a	3,93	-0,005	a	3,12	0,003		1,29	-0,001	a	3,47
12	-0,002	a	4,31	-0,004	a	3,46	-0,001	a	2,72	0,002	b	2,33	-0,013	a	4,05	-0,003	a	3,91	0,003	c	1,75	0,004	b	2,12	0,007		1,49	0,000	b	2,06
13	-0,004	a	3,57	-0,004	a	3,86	0,008	b	2,07	0,002	b	2,34	0,015		0,96	0,003	b	2,51	0,000	a	2,60	0,007		0,55	-0,007	a	3,31	0,001	b	2,28
14	-0,010	a	4,83	0,003	c	1,76	0,007		0,85	0,009		0,53	0,003		1,33	-0,004	a	2,88	0,006		0,89	-0,008	a	3,83	0,005		0,88	0,004		0,67
15	0,012		0,27	-0,005	a	3,55	0,000	a	3,63	0,005	c	1,66	-0,001	b	2,34	-0,003	a	4,55	0,003		1,48	0,002	c	1,91	0,002	b	2,36	-0,004	a	2,95

Table A4: Effect of Macroeconomic Announcements on Abnormal Returns of PLN/USD

Time	NFP (60)			PMI Man (60)			PMI Non-Man (60)			Retail Sales (47)			GDP (20)			Ind. Prod. (59)			Core DGO (59)			Trade Bal. (51)			CPI (39)			PPI (40)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,001		0,98	0,000	a	3,52	-0,004	a	3,93	0,001	a	3,24	0,010		-0,88	0,000	b	2,31	0,002	a	3,11	0,000	b	2,50	-0,001	c	1,95	-0,003	a	3,19
-4	-0,002	a	4,42	0,000	a	3,28	0,000	b	2,11	-0,001	b	2,24	0,010		-1,40	-0,003	a	3,62	-0,002	a	3,05	-0,007	a	4,72	-0,006	a	3,34	-0,005	a	3,58
-3	0,007		1,26	-0,002	a	2,96	0,010		0,32	0,008		0,07	0,002		1,24	-0,003	a	3,13	0,001	b	2,43	-0,005	a	3,21	0,001	c	1,65	-0,002	b	2,47
-2	0,007		0,83	0,000	a	3,54	0,006		0,51	0,003	c	1,67	-0,005	b	2,28	-0,005	a	4,51	0,002	b	2,28	-0,005	a	3,76	0,000	b	2,57	0,006		0,13
-1	-0,012	a	2,84	0,011	b	2,17	0,002	b	2,19	0,026	a	3,96	-0,032	a	2,84	0,002		0,52	0,002	a	3,32	-0,005	a	2,65	-0,020	a	2,94	0,006	b	2,26
0	-0,029	a	3,59	-0,001	b	2,34	0,002	a	3,11	0,002		1,24	0,013		-0,09	0,006		0,01	0,003		1,42	0,003	a	2,91	-0,006	b	2,05	-0,005	b	2,16
1	0,017		1,29	-0,005	a	3,43	-0,011	a	5,01	0,007	b	1,97	-0,009	a	3,17	0,007		-0,06	0,013		-0,12	0,008		1,36	-0,007	c	1,95	0,002	b	1,96
2	0,009	b	2,26	-0,001	c	1,92	0,005	b	2,17	0,014		0,96	0,013		-0,22	0,007		1,32	0,002	b	2,47	-0,002	a	2,84	0,000	b	2,28	0,008		1,51
3	-0,005	a	2,98	0,005		1,07	-0,002	b	2,48	0,006		1,48	0,002	c	1,96	0,003		0,54	0,004	c	1,95	0,005	c	1,93	0,004		1,02	0,011		0,23
4	-0,010	a	3,68	-0,003	a	3,91	-0,004	a	3,22	0,010		0,81	-0,015	a	3,22	0,000	a	2,69	-0,013	a	4,59	0,001		1,01	0,001		1,42	0,005		0,87
5	-0,017	a	4,71	0,005		1,50	-0,005	a	2,98	-0,002	a	3,72	0,004		1,10	0,007		0,37	-0,006	a	3,39	-0,009	a	3,59	0,000		1,56	0,001	c	1,85
6	0,001	b	2,22	-0,002	a	3,42	0,003	b	2,38	-0,002	b	2,33	0,000		1,33	-0,002	a	2,95	0,003	b	2,48	-0,006	a	4,60	0,002	b	2,29	-0,008	a	4,20
7	0,000	b	2,31	0,006		0,39	0,006		1,02	0,012		0,78	0,027		-1,62	0,001	b	2,34	0,005	b	1,98	0,006		0,90	0,003		1,54	0,001	b	2,27
8	0,007		1,56	0,002	a	2,76	0,007		1,59	0,009		0,81	0,002		1,61	0,000	c	1,77	-0,008	a	5,24	0,000	a	2,60	-0,009	a	4,07	0,010		1,09
9	-0,002	a	2,77	-0,004	a	2,99	-0,003	a	4,61	0,007		1,43	0,002		1,50	0,005	c	1,79	0,002	b	2,02	0,002	b	2,13	-0,002	b	2,05	0,012		-0,36
10	-0,009	a	5,14	-0,002	a	3,42	0,003	b	2,35	-0,007	a	3,77	0,007		0,75	-0,002	a	3,06	-0,009	a	6,79	-0,003	b	2,31	-0,001	b	2,17	0,000	b	2,48
11	0,008	b	2,14	0,004	b	2,32	-0,001	a	3,25	0,006		1,38	0,005		1,03	-0,005	a	2,87	-0,005	a	3,42	-0,008	a	3,39	0,007		0,52	-0,002	a	3,28
12	-0,001	a	2,78	-0,010	a	4,19	0,002	a	2,78	0,002	a	2,87	-0,013	a	3,54	-0,001	b	2,51	0,000	b	2,47	-0,001	a	2,82	0,001	c	1,92	0,006		0,93
13	-0,008	a	3,19	-0,002	a	3,91	0,005	c	1,87	-0,001	a	3,60	0,011		0,83	0,002	b	2,42	0,001	c	1,81	0,007		1,33	-0,013	a	4,63	-0,002	a	2,83
14	-0,004	a	3,39	-0,002	a	2,85	0,006		1,08	0,012		-0,53	0,013		0,08	-0,004	a	2,67	0,000	b	1,98	-0,003	a	2,59	0,003		0,57	0,003		0,30
15	0,005	c	1,68	0,000	b	2,36	-0,001	a	3,52	0,010		1,04	0,001		1,48	-0,004	a	4,21	0,003		1,47	0,004	b	2,27	-0,003	b	2,52	0,000	c	1,89

Table A5: Effect of Macroeconomic Announcements on Abnormal Returns of HUF/USD

Time	NFP (60)			PMI Man (60)			PMI Non-Man (60)			Retail Sales (47)			GDP (20)			Ind. Prod. (59)			Core DGO (59)			Trade Bal. (51)			CPI (39)			PPI (40)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,002		0,68	-0,002	a	3,89	-0,004	a	2,95	0,000	b	2,54	0,004		0,91	0,000	a	2,95	-0,001	a	4,03	0,002	c	1,92	-0,006	a	4,61	-0,009	a	5,56
-4	-0,001	a	2,98	0,005		1,05	0,006		1,15	-0,002	a	2,91	0,007		-0,24	0,001	a	2,77	-0,002	a	3,66	-0,004	a	4,54	-0,006	a	3,14	0,000	a	2,61
-3	0,010		0,64	0,004	c	1,87	0,003	c	1,84	0,009		-0,35	0,006		-0,50	-0,003	a	2,76	-0,002	a	3,22	0,000	b	2,14	-0,002	a	2,97	0,002		1,55
-2	-0,007	a	3,33	-0,001	a	4,32	0,006		1,37	0,000	b	2,28	-0,009	a	3,55	-0,005	b	2,33	0,003		1,54	-0,005	a	4,58	0,001	c	1,77	-0,008	a	2,84
-1	-0,023	b	2,09	0,013		1,18	0,007		0,28	0,018	a	3,66	-0,024	b	2,28	-0,001	b	2,56	0,003	b	2,38	-0,001		1,52	-0,019	a	3,57	0,014		0,82
0	-0,024	a	4,95	-0,001	a	3,18	-0,007	a	4,27	0,007	b	2,14	0,006		-1,16	0,003	b	2,22	0,006		0,43	0,008		1,22	-0,014	a	3,14	0,004		1,03
1	0,021		1,25	-0,002	a	2,62	-0,007	a	4,73	0,002	b	2,38	-0,012	b	2,40	0,003	c	1,84	0,011		-0,10	0,008		0,90	-0,013	a	3,05	0,005		1,42
2	0,006	a	3,69	0,004		1,41	-0,004	a	3,66	0,019		0,47	0,015		0,28	0,007	b	2,03	-0,002	a	3,00	-0,004	a	3,38	0,007		1,49	0,006	b	2,41
3	0,002	a	4,81	0,001	c	1,79	0,002		1,05	0,001	c	1,89	-0,011	a	2,91	0,008		-0,46	0,002	b	2,10	0,007	b	2,56	0,004	c	1,88	0,007		0,14
4	-0,025	a	6,39	0,003	c	1,91	0,005		1,64	0,007		1,26	-0,008	b	2,52	0,004	b	2,31	-0,009	a	3,98	0,001		1,24	0,006		0,56	0,006		0,21
5	-0,014	a	5,32	0,010	c	1,65	-0,010	a	5,10	0,006	c	1,90	0,005		1,13	0,001	c	1,86	-0,008	a	3,92	-0,016	a	4,95	0,003		1,64	0,004	c	1,66
6	-0,001	a	3,14	-0,001	a	3,83	0,001	a	3,04	-0,001	b	2,44	-0,004		1,12	0,009		0,89	0,002	b	2,15	-0,009	a	5,05	0,010		0,81	-0,007	a	3,51
7	0,008		0,70	0,006	c	1,87	0,015		-0,48	0,010		1,17	0,036		-1,83	-0,001	a	3,27	0,003		1,25	0,006		1,63	0,000	b	2,17	0,000	a	3,16
8	-0,003	a	3,93	0,004	b	2,09	0,007		1,08	0,007	b	2,12	0,007		1,02	0,004		1,07	-0,005	a	4,80	0,008		1,59	-0,010	a	5,07	0,009		-0,14
9	-0,002	b	1,99	0,000	a	3,23	-0,001	a	3,76	0,001	b	1,97	-0,002	b	2,08	0,005	c	1,66	0,002	c	1,91	0,000	b	2,27	0,002	b	2,15	0,009		0,57
10	-0,004	a	4,14	0,000	a	3,57	0,000	a	2,69	-0,003	b	2,45	0,024		-0,64	-0,001	a	3,70	-0,007	a	4,84	0,002		1,48	-0,005	a	2,78	0,002	c	1,95
11	0,004	b	2,15	-0,006	a	4,63	0,000	a	3,42	0,009		0,92	0,004		0,34	0,000	c	1,90	-0,007	a	3,72	-0,012	a	3,53	0,008		1,23	-0,003	a	2,87
12	0,001	a	2,61	-0,005	a	4,44	-0,006	a	3,90	0,006	b	2,37	-0,009	b	2,35	-0,006	a	4,95	-0,003	a	3,39	0,004	c	1,68	0,003	c	1,72	0,003		1,26
13	-0,004	a	4,54	-0,002	a	3,32	0,000	a	3,79	-0,003	a	2,83	0,005		1,15	-0,001	a	3,00	0,002		1,63	0,002		1,52	-0,011	a	4,92	0,000	c	1,91
14	-0,009	a	5,16	-0,001		1,58	0,009		-0,08	0,008		0,16	0,005		0,86	0,003	b	2,11	0,002	c	1,77	-0,005	a	2,76	0,009		-0,38	0,005		0,69
15	0,004		1,59	0,006		1,63	-0,006	a	5,17	0,008		1,39	-0,003	b	2,16	-0,008	a	3,93	0,006		1,43	0,002		1,64	0,001		1,45	-0,001	b	2,56

Note: Tables A3–A5 contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: NFP – Nonfarm Payrolls, PMI – Purchasing Managers' Indices from Manufacturing and Non-Manufacturing Sectors reported by ISM, Retail Sales, GDP – gross domestic product, Ind. Prod. – industrial production, Core DGO – Core Durable Goods Orders, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

Table A6: Effect of Macroeconomic Announcements on Abnormal Returns of CZK/EUR

Time	ZEW (57)			PMI (32)			IFO (58)			Ind. Prod. (60)			GDP (20)			Retail Sales (59)			Trade Bal. (55)			CPI (58)			PPI (58)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,000	a	2,69	0,004	a	2,70	0,003		1,41	-0,002	c	1,72	0,000		1,61	-0,001	b	2,57	0,000		1,10	0,001	a	2,95	-0,001	b	2,23
-4	0,002	c	1,73	-0,004	a	3,28	0,001	a	3,22	-0,002	a	5,18	-0,001		1,43	0,002	a	3,12	0,003	c	1,95	0,001		1,64	0,000	a	3,86
-3	-0,002	a	4,57	-0,001	b	2,00	-0,001	a	4,26	0,003		0,51	0,001		0,32	0,001	b	2,26	-0,002	a	3,78	-0,002	b	2,46	0,001		1,34
-2	0,001	c	1,95	-0,001	b	2,57	-0,002	b	2,51	0,002	a	2,83	0,001		1,11	-0,002	a	3,25	0,000	a	2,74	0,004	b	2,28	-0,001	a	3,25
-1	0,001	c	1,90	0,001		0,86	0,003		0,44	-0,002	a	2,75	-0,006	a	4,45	0,000	a	3,14	-0,002	a	3,02	-0,003	a	2,90	-0,002	a	3,77
0	-0,001	b	2,52	-0,011	a	2,84	0,002	a	3,47	0,000	b	2,47	-0,001	c	1,89	0,002		0,71	0,000	a	3,18	-0,001	a	4,33	0,000	a	4,63
1	0,001		0,50	0,007		0,54	0,006		0,84	-0,001	a	2,86	0,000	a	3,25	0,002	a	3,61	-0,005	a	3,37	-0,001	a	5,25	0,002	a	3,04
2	0,000	b	2,05	0,002	a	3,57	0,001	c	1,65	0,001	a	4,82	0,004	c	1,65	0,002	c	1,76	-0,003		0,40	-0,001	c	1,69	0,000	b	2,22
3	-0,002	a	6,49	-0,004	a	3,76	0,003	a	2,76	-0,001	a	4,34	0,000	b	2,09	0,002		0,33	-0,001	b	2,33	0,000		0,67	-0,006	a	5,68
4	-0,001		1,17	-0,002	a	3,18	0,003	b	2,30	-0,001	a	4,62	-0,003	a	3,51	0,004		-0,37	0,000	a	4,42	-0,001	a	4,82	0,000	c	1,65
5	0,001	a	4,24	0,000	a	5,54	-0,002	a	4,58	0,002		-0,54	0,001	a	2,61	-0,003	a	5,03	0,002	a	3,61	0,002	b	2,43	0,000		1,32
6	0,001		0,88	-0,003		1,58	0,000	a	4,94	-0,003	a	5,01	0,001		-1,92	0,000	c	1,87	0,000	a	3,94	-0,003	a	4,40	0,000	c	1,81
7	0,001	b	2,21	0,001	a	3,03	0,000	a	4,49	0,000	a	5,04	0,000	c	1,79	0,000	a	2,89	0,002	a	3,37	0,001	a	4,17	0,003	b	1,96
8	0,000	b	1,97	-0,001		0,72	0,005		0,35	0,001		0,39	-0,001	a	3,54	0,004		-0,65	-0,003	a	4,86	-0,001	a	3,62	0,000	a	5,67
9	0,002		0,16	-0,001	b	2,45	0,003	b	2,35	0,001		1,12	-0,002	a	3,54	0,000	a	4,65	0,002		-1,22	-0,001		1,04	-0,001	a	4,29
10	0,002		1,33	0,000	b	2,57	0,001	a	4,83	-0,002	a	5,18	0,000		0,50	-0,001	a	4,11	0,001		-0,15	0,000		-0,75	0,001		-1,01
11	0,002		-0,21	-0,006	a	4,71	0,000	c	1,76	0,002		1,10	-0,002	a	2,77	0,002	a	3,41	0,001		-0,15	-0,002	a	3,32	-0,001	b	2,19
12	0,002		-0,37	-0,003	a	4,55	-0,003	a	3,17	0,003		-0,22	-0,001	a	2,59	-0,001	a	5,61	0,003		0,60	-0,001		1,20	0,002		-0,30
13	0,001		1,12	-0,001	a	4,00	0,001		1,33	-0,002	a	3,20	0,000	a	2,62	-0,002	a	4,17	0,000	a	2,59	0,001	a	3,01	-0,003	a	5,36
14	-0,001	a	4,58	-0,001	b	2,44	0,004	b	2,54	0,001	a	4,43	0,003	b	2,51	0,001	a	2,77	0,001		0,94	-0,002		1,06	-0,001	a	3,11
15	-0,002	c	1,65	0,002	b	2,38	0,001	a	3,21	0,000	a	4,79	0,002	a	2,71	0,000	a	3,96	0,000		0,07	0,001		0,93	0,001	a	3,72

Table A7: Effect of Macroeconomic Announcements on Abnormal Returns of PLN/EUR

Time	ZEW (57)			PMI (32)			IFO (58)			Ind. Prod. (60)			GDP (20)			Retail Sales (59)			Trade Bal. (55)			CPI (58)			PPI (58)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	-0,003	a	3,19	0,004		0,10	-0,001	b	2,02	0,000	b	2,37	0,001		0,88	-0,002	a	3,45	-0,006	a	3,40	0,001	a	3,34	-0,005	a	5,87
-4	0,003	c	1,81	-0,005	a	3,12	0,001	c	1,90	0,000	a	2,97	0,000		0,19	-0,003	a	5,37	-0,002	a	3,43	0,002		1,45	0,000	a	3,48
-3	0,000	a	2,94	-0,007	b	2,22	-0,005	a	4,41	-0,002	a	3,63	-0,004	b	2,57	-0,001	a	3,62	-0,002	a	4,53	-0,004	a	5,72	0,003		1,22
-2	0,003		0,57	0,000		1,43	0,000	b	2,55	0,000	b	2,22	-0,003	b	2,09	-0,002	a	2,70	0,004		1,18	0,001	b	2,36	0,006		-0,97
-1	0,005		-0,50	-0,007	a	3,01	0,007		1,28	0,002		1,13	0,007		-1,64	0,004		0,34	0,006		-0,91	-0,002	a	3,21	0,003	b	2,10
0	0,001	b	2,16	-0,003	a	4,08	0,008	c	1,73	0,002	a	3,07	-0,005	a	3,65	0,003		0,60	-0,002	a	3,19	-0,001	a	3,41	0,004		-0,47
1	0,002	b	2,25	0,006		-0,43	0,002	c	1,90	-0,003	a	3,48	0,012		-0,41	0,000	a	3,02	0,002		1,24	0,005		-0,04	0,001	a	2,89
2	0,006		0,22	-0,011	a	5,22	0,002		1,27	-0,002	a	4,91	-0,003	a	3,06	0,002	a	2,61	-0,003	a	2,75	0,001	a	3,49	-0,001	a	2,76
3	0,001	a	3,05	0,001	c	1,72	0,002		1,22	0,002	a	4,10	-0,001	a	3,24	0,003		1,11	0,004		-0,85	0,001	b	2,26	0,002		1,47
4	0,002		1,11	0,002		0,99	-0,005	a	4,89	0,001	a	3,42	-0,006	a	5,82	-0,001	a	3,38	-0,003	a	3,84	-0,002	a	4,07	-0,002	a	3,85
5	0,004	c	1,66	0,004		1,14	0,000	b	2,37	0,000	a	3,43	-0,001	a	2,59	0,002	a	2,60	0,001	b	2,51	-0,003	a	3,79	-0,003	b	2,56
6	-0,002	a	3,49	-0,005	a	3,85	-0,001	a	2,72	0,000	a	3,81	-0,002	b	2,11	0,000	a	2,78	0,002		1,52	-0,001	a	3,84	-0,001	a	3,07
7	-0,001	c	1,74	-0,005	a	3,10	-0,005	a	4,25	0,000	a	4,41	0,004	c	1,78	-0,001	a	3,40	0,000	b	2,01	-0,002	b	2,29	0,002		1,34
8	0,001	a	4,04	-0,005	a	3,52	0,002		1,20	0,002	a	4,27	0,003	b	2,09	-0,002	a	5,35	-0,002	a	3,02	-0,001	b	2,24	0,001		1,34
9	-0,002	b	2,33	0,002		1,09	0,000	a	3,56	-0,002	a	4,85	0,000	a	3,00	-0,005	a	6,77	-0,002	a	3,31	0,000		0,61	0,001	b	2,32
10	0,002		0,89	-0,001	b	2,06	-0,006	a	5,67	0,000	a	4,25	-0,001	b	2,51	-0,002	a	3,82	-0,003	a	2,94	0,002		1,11	-0,002	b	2,42
11	0,000	a	2,65	0,002		-1,81	0,002	a	2,60	-0,002	a	3,62	0,004	c	1,66	-0,002	a	5,51	0,007		-1,88	0,000		1,59	0,000	a	3,25
12	0,001	b	2,07	0,002	b	2,28	0,004		0,75	0,001	a	3,50	0,001		0,55	-0,002	a	2,94	-0,002	a	2,85	0,000	b	2,36	0,002	a	2,69
13	0,002		0,37	-0,003	a	2,98	-0,001	a	3,64	0,000	a	4,34	-0,002	a	3,34	0,003		1,07	0,000	b	2,44	0,001		0,70	0,003		-0,53
14	0,004	c	1,81	0,000	c	1,69	-0,002	a	3,08	-0,001	a	3,56	0,002	b	2,05	0,000	b	2,11	0,003		0,05	-0,001	b	2,57	0,002		0,06
15	-0,003	a	3,63	-0,002	a	3,66	0,005		0,25	-0,001	a	4,51	0,002		0,78	-0,001	a	5,19	0,002		1,43	0,002		0,86	0,002		0,66

Table A8: Effect of Macroeconomic Announcements on Abnormal Returns of HUF/EUR

Time	ZEW (57)			PMI (32)			IFO (58)			Ind. Prod. (60)			GDP (20)			Retail Sales (59)			Trade Bal. (55)			CPI (58)			PPI (58)		
	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q	AR %		Tcz Q
-5	0,002	a	2,83	0,000	c	1,91	-0,001	a	3,40	-0,002	c	1,87	-0,005	b	2,02	0,003		1,20	-0,003	c	1,86	0,007		0,27	-0,003	a	3,52
-4	0,004		0,03	0,004		-0,27	-0,003	a	3,09	0,001	a	3,05	-0,003	c	1,90	0,002	a	2,93	0,009	c	1,96	0,000	b	2,47	-0,002	b	2,32
-3	0,003		1,44	-0,007	a	3,58	-0,005	a	4,08	0,003		0,58	-0,001		0,34	-0,002	a	3,32	0,002	b	2,38	0,002		1,50	0,003	b	2,15
-2	0,004		1,54	0,001	b	2,52	-0,002	a	3,85	0,000	a	4,05	-0,002	b	2,42	-0,002	a	3,73	0,001	a	4,13	0,000	a	2,72	-0,003	a	3,16
-1	0,002	c	1,68	0,003		-0,46	0,011		1,11	-0,004	a	4,21	-0,005		0,98	0,005		0,49	0,003		1,48	0,002		1,52	0,003	b	2,38
0	0,000	b	2,23	-0,003	a	3,97	0,005	c	1,74	0,003	c	1,81	0,001		1,32	-0,001	b	2,55	0,002	a	2,61	0,006		0,39	-0,001		1,45
1	0,002	c	1,83	0,000	a	2,68	-0,003	a	4,41	-0,001	a	3,77	0,001		0,86	0,001	b	2,12	-0,002	a	2,83	-0,001	b	2,22	0,000	b	2,23
2	0,001	b	2,07	-0,001	b	2,04	0,005		0,83	0,002	a	3,16	-0,004	a	2,60	-0,006	a	4,91	-0,008	b	2,57	0,005	a	2,79	0,000	b	2,45
3	0,003	a	2,92	-0,002	b	2,26	0,002	c	1,81	0,004		1,32	-0,017	a	3,72	0,001		1,33	0,004	c	1,91	0,002	a	3,01	0,003		0,69
4	0,004		0,49	-0,006	a	3,94	-0,003	a	3,79	0,002	a	3,65	0,005		1,61	-0,002	a	5,30	-0,003	a	3,18	0,001		1,34	-0,002	a	2,85
5	0,000	a	3,57	0,000	b	1,98	0,002	a	3,26	0,004	a	2,63	0,003	a	2,75	0,005		0,50	-0,004	a	4,47	-0,005	a	4,90	-0,003	a	4,70
6	-0,003	a	3,19	-0,001		0,72	-0,003	a	4,28	-0,003	a	4,94	0,004		1,54	0,002	b	2,52	0,002		1,59	0,003		1,07	-0,003	a	4,98
7	0,003	b	1,97	0,000	a	2,88	-0,001	a	3,27	0,000	a	2,66	-0,003		0,71	0,000	a	3,35	0,007		-1,97	-0,001		1,61	0,000	a	3,29
8	-0,002	a	3,22	-0,005	b	2,52	-0,003	a	4,74	0,001	a	2,83	0,001	a	2,61	-0,004	a	5,00	0,000	c	1,94	0,000	a	2,79	0,002	a	3,08
9	-0,001	a	4,33	-0,006	a	4,45	0,001	a	2,61	-0,002	c	1,94	0,006		0,89	0,001	a	3,34	0,005		0,57	-0,003	a	4,26	0,002	b	2,37
10	-0,002	a	3,56	0,000	a	2,64	0,001	c	1,67	-0,001	a	4,74	-0,003	a	3,21	-0,002	a	4,46	0,000	a	2,97	-0,006	a	3,40	-0,006	a	3,97
11	0,000		1,10	0,003		0,23	-0,001	a	3,26	0,003	b	2,29	0,001	c	1,77	-0,001	b	2,55	0,007	a	2,59	-0,001	a	3,04	0,000	c	1,65
12	0,001	a	4,06	-0,002	a	4,42	-0,002	a	4,63	0,001	b	2,28	0,003		1,59	-0,002	a	4,22	0,004		1,31	0,001	a	2,67	0,002		-0,03
13	0,000		1,62	-0,004	a	3,17	-0,003	a	2,91	0,002	c	1,87	-0,002	a	3,51	-0,002	a	3,39	-0,003	a	3,22	-0,003	a	4,25	-0,004	a	3,99
14	0,006		1,37	-0,004	a	3,23	0,001		1,04	-0,002	a	4,11	-0,002	b	2,30	0,002	a	2,81	-0,004	a	4,63	-0,005	a	4,51	-0,001	a	3,64
15	-0,001	a	3,43	-0,003		1,49	0,000	b	2,26	0,001	a	3,20	-0,001		1,60	0,000	a	2,76	0,003	a	2,61	-0,001	a	2,75	0,001		1,50

Note: Tables A6–A8 contain values of mean abnormal returns (AR in %) on currency pairs as an effect of the following macroeconomic announcements in the event window: ZEW – German Economic Sentiment Index, PMI – Purchasing Managers' Index, IFO – German Business Climate Index, Ind. Prod. – industrial production, GDP – gross domestic product, Retail Sales, Trade. Bal. – trade balance, CPI – consumer price index, PPI – producer price index. Due to the absence of neutral news for PMI, the abnormal returns are not reported. T_{CZ} is the Corrado–Zivney T_{CZ} rank test statistics defined as in Corrado (2011). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The sample runs from January 3, 2001 to December 31, 2015.

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