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Abhandlungen

Which Fundamental News Moves the Markets?

Fundamental News and its Impact on Equity, Bond and Foreign Exchange Markets

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I. Introduction

Information about the condition of an economy is relevant for many persons and therefore a great many of economic indicators exists which can offer insight into various aspects of economic life. It is well known that financial markets are driven by economic aspects, at least in parts. Hence an obvious key question for market participants is how financial markets react to new information coming from economic indicators: Do all economic indicators have an impact on financial markets or only some of them? Are some indicators more relevant than others, and does the impact of indicators vary for different segments of financial markets like bonds, equities and foreign exchange?

We answer these crucial questions by analyzing the impact of indicators on these segments in Europe. In our study we incorporate indicators from important parts of the world: national economic indicators from Germany and the US as well as supranational indicators from the Euro zone. We identify the relevant economic indicators for the studied market segments and give a ranking about their relevance on each segment. Our results contribute to the understanding of pricing behavior on financial markets as no similar study is known to the authors and as no market consensus seems to exist about the importance of economic indicators. A brief review of the literature and a small survey can show this.

In literature a high number of studies regarding market movements and their causes can be found. Macroeconomic news releases on financial markets have been discussed for many years and are still investigated nowadays. The high number of studies makes it impossible to give a complete overview about the existing literature in this area of research

and is not aim of our paper.[1] But the current state of the discussion can be described shortly.

Early papers in this topic arose at the time when higher frequency data became available, i. e. in the eighties of the past century.[2] The focus at that time was to test whether price reactions on one dedicated market can be attributed to public releases of macroeconomic information. Due to the novelty of the topic only one market, mostly the bond market, and only news releases from one nation were regularly analyzed. Younger studies can be found where this is still the case.[3]

However recent studies do not focus on a single market and on news from only one nation. Many papers analyze the impact of international macroeconomic news releases on one dedicated market as global integrated markets should allow international news to have effects on local markets.[4] And lately the discussion has turned towards the joint analysis of multiple markets, i. e. different asset classes in different countries.[5] The question in this context is whether one single information has a joint impact on various markets simultaneously.

When research in this area began it was usually tested whether the simple release of a macroeconomic information has an impact on financial markets. But for many years market participants have been regularly asked about their prediction on macroeconomic releases in the near future. Aggregating these individual predictions results in so called consensus forecasts, which can be used in an interesting way: Deviations of actual macroeconomic releases from their former consensus values can be interpreted as the surprise part of a macroeconomic release. And according to classical economic theory only new information, i. e. surprise, should cause financial markets to react. Therefore by now it is very common to only look at the surprise part of macroeconomic releases when analyzing price reactions of news releases. With the surprise part it can be checked whether bad surprises have a different impact on markets than good surprises or whether a higher level of surprise causes more intensive reactions on financial markets than small surprises.[6]

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[1] Among others *Chaboud* et al. (2004) give a brief summary of the main research streams in the field of market movement analysis.

[2] See for example *Urich/Wachtel* (1984).

[3] See for example *Baldouzzi/Elton/Green* (2001).

[4] See for example *Kesy* (2004).

[5] See for example *Boyd* (2005), *Andersen* et al. (2006) and *Faust* et al. (2006).

[6] See for example *Fleming/Remolona* (1997).

Next to price reactions the behaviour of traded volume and volatility in the surrounding of macroeconomic releases is also often researched.[7] By now it is well known that prior to important macroeconomic releases the traded volume reduces significantly. Directly after a release the price movement happens very quickly (mostly within seconds) and traded volume increases as well as volatility. The high volume and volatility can then be observed over a longer period of time in contrast to the shorter price reaction.

As can be seen many topics regarding the impact of macroeconomic releases on financial markets have been studied in the last decades. However the main statements of the entire research can be summarized very quickly:

– Some macroeconomic releases affect the markets and some do not.

– Foreign macroeconomic releases can have an influence on local markets.

– All segments of financial markets (bonds, FX and equities) can be influenced by macroeconomic releases.

– An impact of a macroeconomic release happens very quickly, almost immediately after a release.

It can be observed that there is a trend in the literature to employ highly sophisticated empirical methods that do not lead to other crucial statements than those cited above.[8] It is therefore surprising, that one topic is almost not analyzed and thus not well known: the ranking of the high number of macroeconomic releases regarding their importance. This ranking and reasons for it is the primary goal of our study. So we contribute to the literature by giving answers to the following questions:

[7] See for example *Fleming/Remolona* (1999).

[8] See *Andersen* et al. (2006) for an arbitrary but illustrative example: They analyse the impact of US macro releases on FX, bond and equity markets in different countries. They utilize very sophisticated methods, which they call "new statistical procedures", that enable them to measure the simultaneous effect of US macro releases on these markets. Their findings are: a) markets do react to macro releases; b) different markets do react to the same macro release and thus markets are fundamentally linked; c) the surprise effect on stock markets changes during the business cycle, thus averaging over business cycles might bias the real impact. Only the last result is not well-known, and for none of these results is their methodology probably necessary.

– Which are the important indicators, and which are less important?[9]
– Is the importance ranking the same on bond, equity and foreign exchange markets?
– Can the importance ranking of economic indicators be explained by economic theory?

To preclude that despite the lack of literature in this field the answers to these questions are already well-known in praxis, we surveyed 38 selected practitioners about their view on the importance of selected economic indicators.[10] The selected indicators were the same ones that we employ in our study and the surveyed persons should rate each indicator by their subjective importance for the DAX (equity market), the Bund Future (bond market) and EUR-USD (FX) on a range from "0" (no impact) to "10" (very high impact).[11]

The scope of the practitioners' ratings was never less than 6 values, i. e. it exceeded always half of the possible range. Moreover to many of the 38 economic indicators almost the entire possible range (a scope of at least 10 values) was attributed. This "entire-range-criteria" could be observed for 12 economic indicators when asked for their effects on the DAX, for 14 with regard to the Bund future and for 18 with respect to the USD-EUR. And it is interesting to note, that the answers resulted in smaller ranges only when all of our practitioners assigned comparatively low values to the respective economic indicator.

Though this survey is not representative it illustrates an interesting phenomenon: no consensus between market participants seems to exist regarding the importance of economic indicators on financial markets. We therefore think, that our analysis of the impact of economic releases on European markets contributes to practitioners as well as to the literature.

The paper is structured as follows: In section II the data for our empirical study is described. We explain the market data as well as the in-

[9] Only a few sources do try to answer this question by ranking the importance of indicators. See *Schwab* (2007) or *Mattern* (2000). However in both sources indicators are ranked with a subjective methodology.

[10] The survey was conducted with 38 practitioners, 16 of them fund managers, 13 traders and 9 market analysts. Nine of them have a focus on stocks, 8 of them on bonds, 8 practitioners are focused on the currency market, and 13 of them are not mainly limited to one single market.

[11] The option "No Opinion" was also available for each indicator on each segment.

dicators we look at. Additionally, descriptive results that give first impressions about the relevance of economic indicators are shown. The statistical methodology and its properties are discussed in section III. In section IV the empirical results are presented and interesting findings extracted. A conclusion ends the paper.

II. Data Description

1. Stock, Bond and FX Data

In our study we employ market data for equity, bond and FX markets. To cover a representative portion of these markets for each of these three segments we use the biggest European counterparts. We limit our analysis to the European region as the European markets are open during the regular publication times for all major macroeconomic releases while the American or Asian markets are closed at European publication times as well as for most US publications. We thus study the German DAX as proxy for equity markets, the German government bond future contracts as proxy for bond markets and the EUR-USD exchange rate as proxy for FX markets. We cover the entire years from 1997 to 2005.[12]

The source for the DAX data is the Karlsruher Kapitalmarktdatenbank (KKMDB)[13], a database that delivers financial market data used in many research papers. KKMDB receives the data directly from different exchanges, thus the original source for the DAX data used in this paper is the Deutsche Boerse AG.[14] We received the data as tick data and transformed them into 5-minute intervals using the last quote within each 5-minute interval.

Due to the introduction of the common European currency in 1999, the FX data needed to be adjusted prior to being usable. For the years 1997 and 1998, we use USD-DEM data as this has been the major currency pair with the most trades available at that time. Another reason to use USD-DEM instead of USD-ECU data (or a different currency pair than USD-DEM) is that most trades between the US-Dollar and other Eu-

[12] Thus we had to use the USD-DEM exchange rates in the years prior to the introduction of the Euro (1997 and 1998) as will be described later.

[13] For more information about the KKMDB see http://fmi.fbv.uni-karlsruhe.de.

[14] As we use data from electronic trading, we use IBIS-DAX data from January 1997 to November 27, 1997. After that IBIS-DAX was terminated and replaced by the XETRA-DAX which is the source of our data for the remaining years until 2005.

ropean currencies (XXX) were conducted through USD-DEM and DEM-XXX respectively. This also increased the number of trades in USD-DEM. For the years 1999 to 2005, we use EUR-USD data. As we employ intra-day returns of our time series, this switch does not affect our analysis. The source of the FX data is Seasonal Charts.[15]

The source for the bond market data is TickData Inc. Corresponding to the DAX data, we transformed this data from tick by tick into 5-minute intervals by using closing data. The different trading schedules on the three markets lead to individual time frames for each of the markets we looked at.[16] Thus we do not have exactly the same data points for all of them.

2. Macroeconomic Announcement Data

We study macroeconomic releases from the US, from Germany and from the entire Euro zone. Within Europe we concentrate on the German market as Germany is the biggest market in Europe and the German interest rates are commonly known as benchmark rates. Besides that, the Euro zone macroeconomic releases are part of our study because the European countries are becoming more and more a supranational economic region which should result in measurable influence of European indicators.

Finding the macroeconomic announcement data was much more challenging than getting the above described market data. Sometimes it was hard to identify the exact date of news releases. This especially was the case for European and German data, where sometimes even the publishing organizations themselves are partly not able to reconstruct their former releases. Therefore our main source to reproduce the announcement data have not been the original organizations but Bloomberg. Bloomberg

[15] For more information about seasonal charts see http://www.seasonalcharts.de.

[16] Currencies are traded around the world. Therefore quotes for EUR-USD (or USD-DEM) are available from Sunday evening until Friday evening. Trading times of the Bund future are however fixed by the EUREX. From Jan 1, 1997 until July 31, 1997, trading of the Bund future were from 8:00 am to 5:30 pm. On Aug 1, 1997 the EUREX extended these trading times until 7:00 pm. Trading for the DAX varied a lot more. For the period from Jan 1, 1997 to Sep 17, 1999, trading took place from 9:00 am until 5:00 pm. From Sep 20, 1999 to June 1, 2000, trading times were extended to 5:30 pm. The longest trading times can be observed from June 2, 2000 to Oct 31, 2003, when electronic trading was available from 9:00 am until 8:00 pm. Due to the low volume in the evening hours since Nov 11, 2003, electronic trading terminates again at 5:30 pm and does so up to now.

has an overview about announcement dates for many economic indicators. Unfortunately some dates are missing in Bloomberg's list and some publication events are published with wrong time stamps. Thus we had to double check Bloomberg's macroeconomic announcement data.[17]

The main problem to recover publications of German data is the publication time not the publication date. Therefore many events had to be researched by hand. In contrast most of the European data is now published at 11:00 am and has been published at 12:00 am before spring 2004. The two indicators published by the ECB (monetary aggregates and current account) are now published at 10:00 am and have been published before spring 2004 also at noon. In the US fortunately most indicators are published steadily at the same time where by far the largest part of all indicators is published at 8:30 am ET (2:30 pm CET) or 10:00 am ET (4:00 pm CET).[18]

In the US and Euro zone, date and time of all macro releases are published in advance at the end of the preceding year. Only in case of serious problems will the publication date or time change. In Germany, however, the situation is different. Not only does the time differ from publication to publication for nearly all German indicators.[19] In addition, the publication date is not published far in advance. For many German indicators, the time span between the announcement of the publication and the publication itself is only a few hours. Thus we were only able to check indicators with mostly stable publication times. Fortunately these indicators are the ones most analysts or brokers are focused on in their research papers. Table 1 gives an overview over all indicators we could include in our analysis.

The table contains additional information. First, it shows since when the indicators are available for our calculations as well as the number of publications that have been available since then. Column 4 shows the

[17] First we checked the web pages of the organizations that published the data. Especially for US data this was very helpful as many organizations offer historical release information. Unfortunately this was not the case for European and German data. When we asked the different organizations for their help, all of them promised to check their archives, but only some of them were able to recover missing or to verify questionable announcement dates. In these cases, we have dropped such dates or – in the case of the German CPI data – even the whole time series as these corresponding announcement dates could not be recovered appropriately.

[18] For our calculations we have transferred all times into CET and CEST respectively.

[19] There are indicators for which the publication time is sometime between 8:00 am and 5:00 pm.

Table 1

Release Times and Availability of Indicators Used

USA	Available since	No. of publications used	Current release time	Notes
Labor Market Report	Jan-97	108	02:30 pm	Sometimes affected by DST
Manufacturing New Orders	Jan-97	108	04:00 pm	Sometimes affected by DST
Housing Starts	Jan-97	108	02:30 pm	
Gross Domestic Product	Jan-97	108	02:30 pm	Sometimes affected by DST
Chicago Purchasing Manager Index	Jan-97	108	04:00 pm	Sometimes affected by DST
Consumer Price Index	Jan-97	108	02:30 pm	
Retail Sales	Jan-97	108	02:30 pm	
Empire State Manufacturing Survey	Nov-02	38	02:30 pm	At 02:00 pm until Jun-03
Leading Economic Indicators	Mar-97	107	04:00 pm	Sometimes affected by DST
Trade Balance	Jan-97	108	02:30 pm	
Industrial Production	Jan-97	108	03:15 pm	
Non-Manufacturing ISM Report	Dec-98	85	04:00 pm	Sometimes affected by DST
Manufacturing ISM Report	Jan-97	108	04:00 pm	Sometimes affected by DST
Consumer Confidence	Jan-97	108	04:00 pm	Sometimes affected by DST
Durable Goods Orders	Jan-97	108	02:30 pm	Sometimes at 06:00 pm At 04:00 pm if GDP is published the same day
Personal Income	Feb-97	108	02:30 pm	Sometimes affected by DST Once published at 16:00
Philadelphia Fed Index	Jan-97	108	06:00 pm	At 04:00 pm until May-01
Producer Price Index	Dec-98	108	02:30 pm	

Euro Zone	Available since	No of publications used	Current release time	Notes
Producer Price Index	Aug-99	77	11:00 am	At 12:00 am until Feb-04
Industrial Production	Feb-97	106	11:00 am	At 12:00 am until Feb-04
Retail Sales	Aug-00	65	11:00 am	At 12:00 am until Feb-04
Consumer Price Index	Jan-97	107	11:00 am	At 12:00 am until Feb-04
Labor Market Report	Jan-97	105	11:00 am	At 12:00 am until Feb-04
EU Commission Survey	Jan-99	77	11:00 am	At 12:00 am until Feb-04
Business Climate Indicator	Jan-01	55	11:00 am	At 12:00 am until Feb-04
Monetary Aggregates	Mar-99	85	10:00 am	Different times during first months
Current Account	Apr-99	81	10:00 am	At 12:00 am until May-02
Trade Balance	Apr-99	82	11:00 am	At 12:00 am until Feb-04
Consumer Price Index Estimate	Nov-02	50	11:00 am	At 12:00 am until Feb-04
Gross Domestic Product	Dec-99	77	11:00 am	At 12:00 am until Feb-04
Reuters Purchasing Manager Index	Jan-99	84	09:55 am	At 9:30 am until Aug-01
Reuters Non-Manufacturing Index	Mar-98	94	09:55 am	At 9:30 am until Aug-01

(Continue page 216)

Table 1: Continued

Germany	Available since	No of publications used	Current release time	Notes
ifo Business Climate Indicator	Jan-97	108	10:00 am	Sometimes different times
Industrial Production	Jan-97	108	12:00 am	Different times before Oct-02
ZEW-Index	Jan-97	108	11:00 am	Until Jan-02 at 04:00 pm Until Dec-02 at 03:00 pm
Labor Market Report	Jan-97	108	09:55 am	Numbers available in advance
Manufacturing New Orders	Jan-97	108	12:00 am	Until Dec-02 unregular
Monetary Aggregates	Jan-97	25	09:30 am	Available until Jan-99

current release time while column 5 notes special circumstances, e.g. when the publication is affected by the daylight saving time (DST) or when the publication is published at different release times.

Knowing the actual release times, all indicators except one can be analyzed without further difficulties. The one exception is the Business Outlook Survey of the Federal Reserve Bank of Philadelphia (US Philadelphia Fed Index) on the DAX. The release time for this indicator has been 4:00 pm before June 2001 and is 6:00 pm since then. As trading on the German equity market ends mostly before 6:00 pm the impact of releases at 6:00 pm can not be verified. However, until October 2003 trading hours of the DAX were extended until 8:00 pm, so the influence of the US Philadelphia Fed Index on the stock market can actually be analyzed until October 2003 but not longer. As we have persistent quotes for the two other markets (bond and FX) beyond 6:00 pm, there is no need to shorten the analysis of the US Philadelphia Fed index on the bond market and on the FX markets.

3. Basic Data Analysis

Our analysis is based on 5-minute log-returns. Table 2 shows the key descriptive figures of the three analyzed markets. As can be seen, the average 5-minute return on all markets is almost zero. This implies that the average absolute return as well as the standard deviation is a good estimator for the dispersion of the underlying returns. The standard deviation has by definition a higher value than the average absolute return. However both values express the same information: volatility. Volatility is highest on equity markets and lowest on bond markets with FX markets in between.

Table 2

Descriptive Figures of the Analyzed Markets

	Mean in %	Median in %	Average Absolute Return in %	Standard Deviation in %	Skewness	Kurtosis
Bonds	0.000	0.000	0.039	0.068	–0.2	15
FX	0.000	0.000	0.062	0.109	1.0	30
Equities	0.000	0.000	0.130	0.223	–0.3	13

Bond and equity markets show the common left-skewed properties of financial market returns. This is not the case for the FX market, but as the FX returns are exchange rates, this is not confusing. The kurtosis of all three markets is extremely high, highest on FX markets but also very high on bond and equity markets. Therefore it can be stated that most returns are very small while a small number of returns are extremely high (or low). All in all it has to be noticed that our data are clearly not normally distributed.

To show the characteristics of volatility throughout a typical trading day figure 1 displays the distribution of the average absolute return in average over all trading days. It displays that there are differences and similarities between the intra-day patterns of our three markets. Particularly noticeable are two major peaks, one at 2:30 pm and the other at 4:00 pm. These are the times when most of the US indicators are released. There is a third peak in the Bund future chart and the DAX chart at the end of the trading day. This peak is probably caused by intra-day traders closing their open positions over night. This phenomenon can

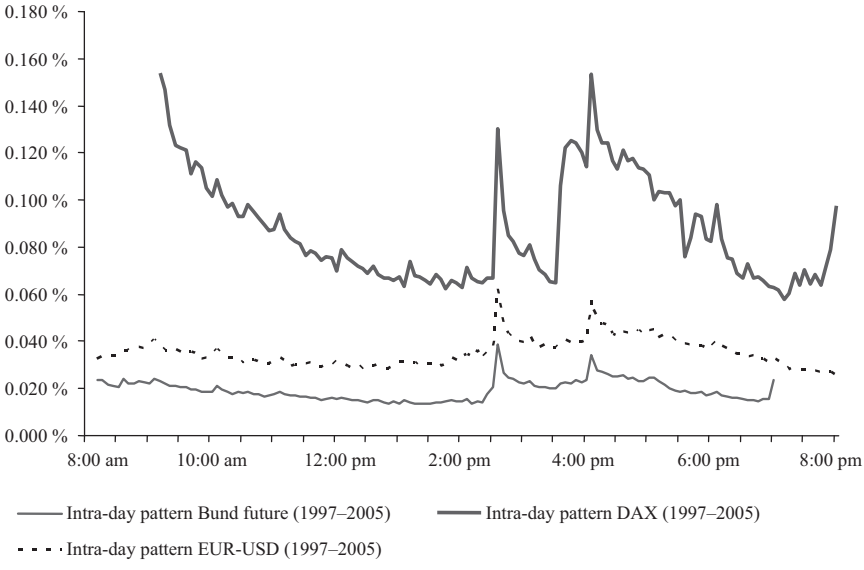

Figure 1: Intra-day Mean Absolute 5-Minute Returns of Bund Future, DAX and EUR-USD (1997–2005)

only be observed on the DAX and the Bund future as their trading times end at specific times of the day while trading on the currency markets takes place 24 hours during week days. Thus FX traders do not need to close their intra-day positions at a certain time and no additional peak can be observed here.

The overnight breaks also lead to a higher volatility in the DAX and in the Bund future charts during the morning hours. In the morning traders need to react to new information from American and Asian markets, which is not possible as long as the European markets are closed. It seems that this effect is more relevant for the stock market than for the bond market as the level of market volatility in the morning hours relative to the rest of the day is much higher on the stock market than on the bond market. Again, no such higher volatility can be seen for EUR-USD because of the non-stop-trading.

Another specific pattern can be seen on the stock market at 3:30 pm. At this time no major economic indicator is released. But the US markets start trading at that time and the DAX is influenced by this. This is the first sign that the US markets might have a huge impact on the European ones.

All the considerations above are based on two arguments. First, markets might exhibit higher average absolute returns because of joint trading, e. g. when many traders are closing their positions, typically at the end of a day. Second and much more important: Markets might exhibit higher average absolute return when new relevant information arrives at the market.

With this in mind and knowing that there are many fundamental news releases at 2:30 p.m. and 4:00 pm respectively, a first interpretation is possible: The releases at 2:30 pm seem to have more impact on the bond market and EUR-USD while for the DAX the releases at 4:00 pm seem to be more important. Additionally, the European and German releases appear to have only little impact on the markets as there is no dedicated peak visible during the morning hours, when these indicators are released. Partly, this can be caused by varying release times, but this will be checked in more detail later.

The above argumentation might be biased as every trading day is included in this first analysis. However the peaks at 2:30 pm and 4:00 pm might as well be caused by other reasons and not by fundamental news releases. To verify whether it is probable that the fundamental news we look at are responsible for the observable peaks, we calculated the corresponding average absolute return on days without any news releases (approx. ¼ of our sample days). The difference between the average for "all"-days and the average of the "no news"-days gives a good indication how much more market-relevant information has arrived on our "news"-days.

In figure 2 these values are displayed for the equity market.[20] The bold line in this chart is identical to the line in figure 1 while the thin line represents the corresponding pattern on "no news"-days. The dashed line is the difference of the two other lines.

As one can see there is no structural difference between the "no-news"-days and "all"-days except around the major release times of 2:30 pm and 4:00 pm. Thus we can conclude that there are extraordinary market moves on our "news"-days that do not occur on "no-news"-days. Therefore it is highly probable that we are looking at especially relevant days.

It can also be identified that volatility for the DAX increases regularly in the afternoon, i. e. on "no-news"-days equally as on "all"-days. The

[20] The corresponding figures for bonds and FX can be found in a document on the website http://www.conquest-investment.de/veroeffentlichungen/68-market mover.

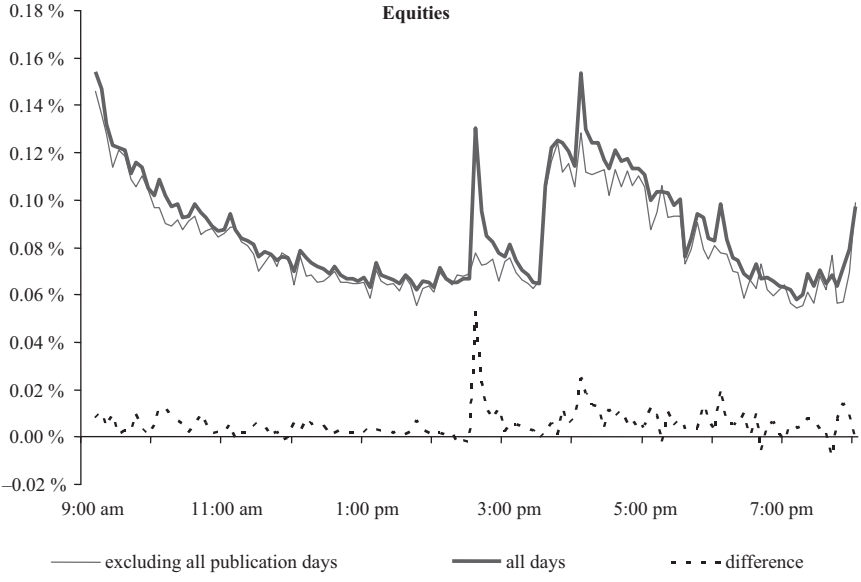

Figure 2: Intra-day Mean Absolute 5-minute Returns with and without all Publication Days (Equities)

obvious reason for this observation, the market opening on Wall Street at 3:30 pm, is relevant on every trading day. Hence the regular volatility level at 4:00 pm is higher than at 2:30 pm, leading to a higher volatility at 4:00 pm than at 2:30 pm. The absolute difference between the two lines clearly indicates however that most relevant fundamental news arrives in the equity market at 2:30, which is consistent to bond and FX markets.[21]

The last statement is based on interpreting the volatility-spread of "news"-days over "all"-days instead of interpreting the absolute volatility. This simple adjustment can remove some bias that is caused simply by the changing level of volatility during trading days. So the volatility-spread seems to be a good but not totally unbiased indicator for the relevance of new information on a market. Applying this simple adjustment makes it possible to measure a volatility-spread for every single indicator in the same way. Table 3 exhibits these spreads for all our indicators sorted by region.

[21] The corresponding charts are included in a document on the website http://www.conquest-investment.de/veroeffentlichungen/68-marketmover.

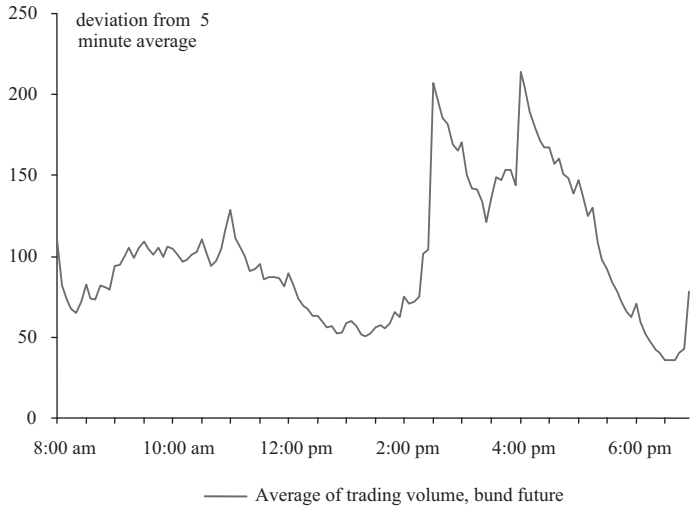

Figure 3: Standardized Trading Volume (Bund Future)

Table 3 clearly indicates that the US indicators are most relevant for all markets. By far the most drastic market responses can be observed when the Labor Market Report is released. Next to the US indicators the German indicators seem to be second in importance. However the most relevant German indicator varies on the three markets. For equity and bond markets the ifo Business Climate indicator is top, for FX the Monetary Aggregates. Top of European indicators is consistent through all markets: the Reuters Purchasing Managers Index. However regionally judged, the European indicators seem to be not very relevant.

In our analysis we focus on price reactions, resp. price volatility, and not the underlying trading volume. To make sure that this focus is not biased it has to be checked whether the observed price reactions are not pure result of low volume, which would imply that the analysis has to be expanded to price reactions and trading volume. The examination of trading volume shows however, that trading volume and price reactions exhibit large parallels. In figure 3 the characteristics of trading volume on the Bund future is displayed as an example.[22] As can be seen, figure 3

[22] Figure 3 displays the average fraction of trading volume of every 5-minute-interval compared to the average 5-minute-volume, standardized for all trading days. E.g. a value of 120 at a specific 5-minute-interval is equal to a volume which is 1.2 times higher than the average 5-minute-interval. As the trading volume has

Table 3

Indicator Specific Volatility Spread and Rank on Bond, Equity and FX Markets

	Bonds	*Equity*	*FX*
	Asset class specific Rank (Volatility-spread)		
DE ifo Business Climate Indicator	15 (0.0433 %)	11 (0.1744 %)	10 (0.0843 %)
DE Industrial Production	24 (0.0236 %)	27 (0.1015 %)	25 (0.0408 %)
DE Labor Market Report	26 (0.0222 %)	24 (0.1128 %)	26 (0.0397 %)
DE Manufacturing New Orders	27 (0.022 %)	28 (0.0942 %)	24 (0.0413 %)
DE Monetary Aggregates	14 (0.0437 %)	17 (0.1318 %)	16 (0.0596 %)
DE ZEW-Index	19 (0.0361 %)	20 (0.1294 %)	21 (0.0491 %)
EU Business Climate Indicator	34 (0.018 %)	37 (0.076 %)	38 (0.0306 %)
EU Commission Survey	36 (0.0177 %)	30 (0.0891 %)	28 (0.0374 %)
EU Consumer Price Index	38 (0.0167 %)	33 (0.0837 %)	35 (0.0344 %)
EU Consumer Price Index Estimate	37 (0.0177 %)	36 (0.0771 %)	36 (0.0343 %)
EU Current Account	28 (0.0219 %)	25 (0.1051 %)	32 (0.0349 %)
EU Gross Domestic Product	32 (0.0183 %)	34 (0.0835 %)	29 (0.0365 %)
EU Industrial Production	30 (0.0193 %)	31 (0.0855 %)	37 (0.0324 %)
EU Labor Market Report	29 (0.0208 %)	35 (0.0834 %)	30 (0.0363 %)
EU Monetary Aggregates	21 (0.0331 %)	19 (0.1295 %)	23 (0.043 %)
EU Producer Price Index	35 (0.018 %)	32 (0.0848 %)	33 (0.0348 %)
EU Retail Sales	33 (0.0183 %)	38 (0.0724 %)	34 (0.0347 %)
EU Reuters Non-Manufacturing Index	25 (0.0227 %)	22 (0.1231 %)	31 (0.0353 %)
EU Reuters Purchasing Manager Index	23 (0.0268 %)	21 (0.129 %)	22 (0.0432 %)
EU Trade Balance	31 (0.0189 %)	29 (0.0942 %)	27 (0.0384 %)
US Chicago Purchasing Manager Index	8 (0.0571 %)	13 (0.1527 %)	14 (0.0649 %)
US Consumer Confidence	11 (0.0511 %)	3 (0.2482 %)	6 (0.0979 %)

	Bonds	*Equity*	*FX*
	Asset class specific Rank (Volatility-spread)		
US Consumer Price Index	5 (0.0695 %)	10 (0.1954 %)	11 (0.0824 %)
US Durable Goods Orders	7 (0.0594 %)	9 (0.1971 %)	12 (0.0798 %)
US Empire State Manufacturing Survey	12 (0.0497 %)	18 (0.1313 %)	8 (0.0895 %)
US Gross Domestic Product	6 (0.064 %)	5 (0.2421 %)	4 (0.1029 %)
US Housing Starts	18 (0.0394 %)	23 (0.1137 %)	18 (0.0528 %)
US Industrial Production	16 (0.0425 %)	16 (0.1359 %)	19 (0.0526 %)
US Labor Market Report	1 (0.1516 %)	1 (0.4242 %)	1 (0.2215 %)
US Leading Economic Indicators	17 (0.0402 %)	15 (0.1416 %)	17 (0.0575 %)
US Manufacturing ISM Report of Business	2 (0.0852 %)	2 (0.2707 %)	3 (0.1077 %)
US Manufacturing New Orders	13 (0.0442 %)	12 (0.174 %)	15 (0.0614 %)
US Non-Manufacturing ISM Report of Business	10 (0.054 %)	7 (0.2176 %)	9 (0.0848 %)
US Personal Income	20 (0.0343 %)	26 (0.1032 %)	20 (0.0498 %)
US Philadelphia Fed Index	9 (0.055 %)	8 (0.2133 %)	13 (0.0753 %)
US Producer Price Index	4 (0.0724 %)	4 (0.2466 %)	5 (0.1013 %)
US Retail Sales	3 (0.0794 %)	6 (0.2393 %)	7 (0.0932 %)
US Trade Balance	22 (0.0319 %)	14 (0.1519 %)	2 (0.1252 %)

is highly identical to the corresponding volatility chart in figure 1. Therefore we can assume that volatility and volume show the same information and we can focus on price volatility only.

Table 3 gives a first view on the potential importance of economic indicators, but the above data are still biased, which makes more sophisticated analysis necessary. To understand the reason for the bias in table 3, think of the following example: The volatility-spread is calculated by

increased sharply in our data window the data was standardized at every trading day, so that the data has been de-trended.

subtracting the average volatility at release time on "all"-days from the observed volatility on "news"-days. As the US Labor Market Report is always released at 2:30 pm and has a high impact on the markets, its releases will lead to a higher average volatility at 2:30 pm, making it difficult for other releases to produce a noticeable market reaction at that time. Thus the volatility-spread will be biased. More clearly the volatility-spread will be biased if two economic releases happen at the same time.[23] Therefore a statistical procedure which is able to overcome those biases is required.

III. Methodology

An often used procedure in literature to identify reactions of financial markets on fundamental announcements is to separate announcements into an expected part and an unexpected part. The expected part is then usually regarded as neutral to financial markets because all expected information is supposed to be already priced correctly. The well-known Efficient Market Hypothesis (EMH)[24] is used as a justification for this approach as according to her only new information should have the power to affect financial markets. Therefore only the remaining unexpected part of fundamental announcements is often regressed on the movements of financial markets in order to identify the potential impact of announcements. However this widespread procedure has significant drawbacks.

On one hand, it is hard to believe that expected information actually does not contain new information: Imagine the market consensus is expecting the FED to raise interest rates by 25bp at the next scheduled meeting. If the FED actually does raise interest rates by 25bp at the next meeting, this would then imply that no new information has arrived at the markets. However clearly there is new information contained in this illustrating example. Before the FED has officially announced to raise interest rates it was not known whether the FED will definitely do so, because the FED could have acted differently. This means that there has been uncertainty about the FED actions ex-ante to the scheduled meeting that is eliminated ex-post. With this in mind it is obvious that inter-

[23] One arbitrary example for this phenomenon is the simultaneous releases of the US Empire State Manufacturing Survey and the US Retail Sales on 15th of February 2005 at 2:30 pm.

[24] See *Fama* (1970).

preting the expected part of an announcement to be information-less is highly discussable.

On the other hand, relevant information can be linked to announcements that go beyond the scope of consensus estimates. The just mentioned FED example is helpful in this context, too. Think of the FED statements where the actual interest policy is announced. These statements include an outlook of the potential behavior of the FED for the successive months. This outlook is sometimes regarded as more important than the interest rate announcement itself.[25] But as the verbal outlook is only qualitative, no quantitative consensus forecast for this information is available. Thus more information is contained in announcement data that goes beyond the scope of consensus data or the deviation from that consensus.

The high relevance of this argument can be illustrated with the market reaction to an interesting FED statement released on January 28, 2004. Before January 2004 there had been a widespread fear of deflationary developments. Thus on June 25, 2003, the FED lowered the Federal Fund target rate to 1.00 per cent. In the meetings following this rate cut, the FOMC noted in each statement "In these circumstances, the Committee believes that policy accommodation can be maintained for a considerable period".[26] The market interpreted the phrase "considerable period" that there will be no rate hike in the near future. On January 28, 2004 however this phrase was dropped and changed to "With inflation quite low and resource use slack, the Committee believes that it can be patient in removing its policy accommodation". There was no change of the Federal Funds Target rate, but the wording had changed. This lead to one of the biggest intra-day swings ever at the Treasury markets.

Moreover it is difficult to correctly separate announcements into expected and unexpected parts technically. Usually the market consensus data are defined as expected information, and the difference between actual numbers and market consensus is defined as unexpected information. However the market consensus can hardly give a true image of market expectations as the surveys that are used to build the market consensus estimates regularly end a long time (up to days) before the announcement itself is published.[27] Therefore the true market consensus

[25] See *Gürkaynok/Sack/Swanson* (2005) or *Ehrmann/Fratzscher* (2007).
[26] See for example *Federal Reserve* (2003).
[27] See *Mattern* (2005), p. 215–220.

will deviate from the reported market consensus simply because of new information arriving shortly before the relevant announcement date. Additionally, data revisions are also relevant because they can influence markets too and are included in the announcements but not in the consensus.[28]

So if we wanted to measure the impact of market consensus deviations on financial markets, a separation of announcements into expectation and surprise would be of considerable benefit. But we want to quantify how much fundamental announcements move the markets and therefore we do not need to distinguish between expectations and surprises.

Next to the above described arguments of firstly neglecting relevant information when using only surprise data and secondly being unable to technically identify the surprise data correctly, one more argument restrains us from separating unexpected from expected parts of announcements in our analysis. Our goal is to quantify and compare the impact of various fundamental announcements on different segments of financial markets (stocks, bonds and foreign exchange). This would simply be impossible if we would separate announcements into expected and unexpected parts.[29] If we would instead analyze the influence of the surprise component of announcements on markets, we could only identify whether deviations from a market consensus have the power to move the markets. The sensitivities of how markets react to such consensus deviations are by nature highly dependent on the scale in which the market consensus and its deviations are measured. Moreover two indicators with the same market sensitivity do not move the markets in the same way if the frequency and the variation of their consensus deviation are not exactly the same, which cannot be corrected for. The sensitivity of financial markets on consensus deviations is therefore no appropriate measure of the impact of the corresponding indicators on the markets.

Thus we employ a methodology that quantifies the total impact that the release of an indicator has on financial markets for each fundamental indicator, regardless of whether the reported numbers are expected, surprising, are part of a revision or caused by simple words. The procedure we employ was first suggested and used by *Ederington/Lee* (1993).[30] The main idea of their methodology is not to classify or quantify the information content of fundamental releases but simply to use the information

[28] For an example see *Mattern* (2005), p. 176–177.
[29] See *Ederington/Lee* (1993), p. 1172.
[30] See *Ederington/Lee* (1993).

that an announcement has been released. In short it is tested whether the behavior of financial markets changes when an indicator has been released. This is done by a dummy regression where absolute returns of the studied market serve as dependent variables and dummies representing the potential release of fundamental indicators are used as explanatory variables.

The model can be formally written as

$$\left|R_{j,t}\right| = a_j + \sum_{k=1}^{K} \left(a_{k,j} \cdot D_{k,t}\right) + e_{j,t}$$

with $R_{j,t}$ as log-return of market j on time t, with a_j being the average absolute return of market j, with $D_{k,t}$ as a dummy variable being 1 if indicator k has been released in t or 0 otherwise, with $a_{k,j}$ as the average impact of dummy $D_{k,t}$ on the average absolute return and with $e_{j,t}$ as the error term covering all unsystematic movements that can not be explained with the dummies.

If in general the release of indicator k has an impact on the studied market, this should be quantified in the model in the following way: Regardless of whether a single release moves the markets up or down, it has the same effect on the regression model. In both cases the release leads to an increase in the absolute return and therefore $a_{k,j}$ quantifies the impact of the releases of indicator k. If $a_{k,j}$ is zero, the release of indicator k has in general no impact at all. The bigger $a_{k,j}$ gets, the bigger is the impact that indicator k has on the market. As a result $a_{k,j}$ serves two purposes. First, it can be checked whether a fundamental indicator has a significant impact on financial markets at all. And as the size of $a_{k,j}$ quantifies the impact of indicator k, it is also possible to rank the indicators by relevance. These are the two main questions we would like to answer in our paper.

Like Ederington and Lee, we ran the described regressions separately for every 5-minute interval, i.e. in each regression always the same 5-minute interval for every trading day is used. Therefore a regression consists of 2278 data points for the DAX and the Bund future as our data set includes 2278 trading days for these two markets and 2341 data points for EUR-USD.[31] As we know the 5-minute interval for each

[31] The difference between the data for the DAX and the Bund future on the one hand and EUR-USD on the other hand is a result of market holidays in Germany. They are only effective for the DAX and the Bund future. Nevertheless, the real

indicator we can identify the corresponding regression to get the appropriate $a_{k,j}$.

If however on one day the release of indicator k has taken place during another 5-minute interval, this release would not be included in that regression.[32] To still cover all releases of a fundamental indicator in only one single regression, special attention has to be paid on indicators with changing release times. To avoid loss of information in these cases we effectively ran one dedicated regression for every indicator. For example, if the indicator has a regular release time of 11:00 am, in the corresponding regression the 5-minute interval from 11:00 to 11:05 am is used. This interval is used for every day in that regression except for the rare days, when the indicator has been released during a different 5-minute interval. In these cases the fitting "off-schedule" 5-minute interval is used.[33]

To sum up, we test whether fundamental news releases have a price effect on financial markets in the first 5 minutes after their release. It is well-known that fundamental news affects financial markets very quickly and that the biggest price impact can be observed directly after the release.[34] With our model we thus can test the maximum impact of every indicator. To make sure that we do not overestimate the importance of an indicator in a regression we additionally set the dummies of other indicators in the regression equal to one on all dates when the corresponding indicators have been released within 60 minutes before the studied 5-minute interval. That is, we adjust for the impact of other releases when we statistically quantify the importance of a fundamental indicator. All in all this methodology proves to be rather simple yet powerful.

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number of data points per regression for all three markets will be less, if no return for a required 5-minute interval is available.

[32] One can argue that such changes in the release time can have an impact on the importance of an indicator solely because of the possibility that market participants do not know when such an indicator will be published. In our view changing trading times do not lead to such confusion because each publication is announced in advance. Thus market participants are not surprised by the release. But even when this would be the case it would be a reason for more, not for less volatility because such a new information would lead to a market reaction.

[33] Differences often happen due to the DST and have been taken into account appropriately.

[34] See *Ederington/Lee* (1995) or *Balduzzi/Elton/Green* (2001).

IV. Empirical Results

The results of our statistical analysis are shown in Table 4. It contains the regression coefficients ($a_{k,j}$) for every economic indicator k on each market j. The higher a regression coefficient gets, the more impact one can attribute to the corresponding indicator. Accordingly the higher the regression coefficient in general is, the more significant our estimations are. To prove this, we also show three standardized levels of significance for the positive impacts in Table 4 if the results are significant. The numbers in parentheses beside these levels of significance show the ranks that the corresponding indicators have within each market so that one can easily spot the relative importance of the significant indicators. Table 4 contains much information about the true importance of the analyzed economic indicators. To annotate every single result would go beyond the scope of this paper. Therefore we have summarized the key observations of Table 4 in 6 findings:

Finding 1: The comparison of the detailed results in table 4 with their counterparts in table 3 indicates that the basic results are not absolutely misleading but clearly biased.

In table 3 we have presented first results of our basic analysis. This table shows the volatility-spread for each economic indicator. As the purpose of the detailed analysis is to overcome the biases of the easy-to-calculate-volatility-spread, we now can evaluate how meaningful the basic analysis is by comparing the results in tables 3 and 4.

The results for the bond market show in both tables that the US Labor Market Report is the most important indicator followed by the US Manufacturing ISM Report of Business. However the statistical analysis identifies the US Consumer Price Index as third most important while the basic methodology attributes rank 5 to that indicator. Further down the bond market ranking, with the detailed analysis, the German indicators for example receive ranks from 9 to 21 while before they had ranks from 14 to 27. The ranking within the German indicators only is to some part identical to the former national ranking, however two of the six German indicators now have different national ranks and the now insignificant indicator (DE ZEW-Index) could simply not be identified with the basic methodology.

This mixture of similarities and differences between basic and detailed results can also be observed on the other two markets. In the equity mar-

ket the first indicator once again is the US Labor Market Report. However the second most important in the detailed results (US Gross Domestic Product) can be found only at rank 5 in the basic results. These differences can become large, as for example in the FX market the fourth most relevant indicator (DE ifo Business Climate Indicator) is attributed only rank 10 with the basic methodology.

To sum up, it can be said that the basic methodology gives good hints for the importance of indicators. However when the importance of single indicators is in question, the sophisticated methodology is necessary.

Finding 2: The US Labor Market Report is by far the most important indicator.

The US Labor Market Report is the most influential indicator we can identify and is ranked number 1 for all three markets. The impact of the US Labor Market Report is so big that, for all three markets, its coefficients are more than double the coefficients at rank two. Thus the US Labor Market Report is not only the most important fundamental indicator but also by far. More details about possible reasons can be found in the following findings.

Finding 3: The importance of an economic indicator can generally be prejudged by its origin: American indicators exceed almost all German ones while the latter are slightly more important than European ones.

As can be seen in table 4, most US indicators are significant in all markets. Out of 18 US indicators only three show no significance in any market (Conference Board's Index of Leading Economic Indicators, Housing Starts and Personal Income). Four indicators are significant in one or two markets (Empire State Index, Manufacturing New Orders, Industrial Production and the US trade balance). The rest are significant in all markets.

In Europe, however, only one of 14 indicators (EU Trade Balance) is significant in all three markets. Four indicators are relevant for at least one segment (Industrial Production, Labor Market Report, Monetary Aggregates and Reuters Purchasing Manager Index).

In Germany out of 6 indicators in our study only the ZEW-Index shows no significant impact in any market and two indicators are significant on less than all segments (Labor Market Report and Monetary Aggregates).

The joint view on all market segments clearly indicates that European indicators are the least relevant indicators if they are sorted by their re-

Table 4

Slope Coefficients and Level of Significance
([‡] Significant on 1 %-Level, [†] Significant on 5 %-Level, [–] Significant on 10 %-Level).
The Number in Parentheses Displays the Rank of the Significant Results

	Bonds	*Equities*	*FX*
	Asset class specific rank (volatility-spread)		
DE ifo Business Climate Indicator	0.2290[‡] (11)	0.7630[‡] (11)	0.5450[‡] (4)
DE Industrial Production	0.0813[‡] (17)	0.2520[‡] (15)	0.0916[‡] (17)
DE Labor Market Report	0.0362[–] (21)	0.0716	0.0249
DE Manufacturing New Orders	0.0650[‡] (18)	0.1960[†] (17)	0.1040[‡] (16)
DE Monetary Aggregates	0.2340[‡] (9)	–0.1190	0.2470[‡] (15)
DE ZEW-Index	0.0554	–0.0558	–0.0524
EU Business Climate Indicator	0.0083	0.0123	0.0092
EU Commission Survey	–0.0091	–0.0653	–0.0467
EU Consumer Price Index	0.0080	0.0628	0.0357
EU Consumer Price Index Estimate	0.0338	0.0719	–0.0616
EU Current Account	–0.0055	–0.0934	–0.0600
EU Gross Domestic Product	0.0199	–0.0444	0.0054
EU Industrial Production	0.0369[†] (20)	0.0067	–0.0394
EU Labor Market Report	0.0025	0.1100	0.0579[–] (19)
EU Monetary Aggregates	0.1080[‡] (15)	0.1540	0.0213
EU Producer Price Index	0.0202	–0.1680	0.0402
EU Retail Sales	0.0143	–0.2350	–0.0292
EU Reuters Non-Manufacturing Index	0.0213	0.0767	0.0078
EU Reuters Purchasing Manager Index	0.0379[–] (19)	0.2410[–] (16)	0.0050
EU Trade Balance	0.0344[–] (22)	0.1680[–] (18)	0.0648[–] (18)

(Continue page 232)

Table 4: Continued

	Bonds	*Equities*	*FX*
	Asset class specific rank (volatility-spread)		
US Chicago Purchasing Manager Index	0.2520‡ (8)	0.8930‡ (10)	0.3050‡ (13)
US Consumer Confidence	0.1930‡ (13)	1.0180‡ (8)	0.4180‡ (6)
US Consumer Price Index	0.4170‡ (3)	0.9700‡ (9)	0.2680‡ (14)
US Durable Goods Orders	0.3490‡ (7)	1.0230‡ (7)	0.3950‡ (8)
US Empire State Manufacturing Survey	0.0918	–0.0074	0.3480‡ (10)
US Gross Domestic Product	0.4070‡ (4)	1.5470‡ (2)	0.6210‡ (3)
US Housing Starts	0.0289	–0.0678	0.0270
US Industrial Production	0.2080‡ (12)	0.7450‡ (13)	0.1030
US Labor Market Report	1.2780‡ (1)	3.3670‡ (1)	1.7800‡ (1)
US Leading Economic Indicators	0.0495	0.2230	–0.0030
US Manufacturing ISM Report of Business	0.5610‡ (2)	1.3230‡ (3)	0.5160‡ (5)
US Manufacturing New Orders	0.0836† (16)	0.1130	–0.0170
US Non-Manufacturing ISM Report of Business	0.2330‡ (10)	0.7620‡ (12)	0.3270‡ (12)
US Personal Income	0.0339	–0.0447	–0.0175
US Philadelphia Fed Index	0.1240‡ (14)	1.2860‡ (4)	0.3720‡ (9)
US Producer Price Index	0.3670‡ (6)	1.2570‡ (5)	0.4110‡ (7)
US Retail Sales	0.4070‡ (4)	1.0610‡ (6)	0.3370‡ (11)
US Trade Balance	–0.0093	0.3910† (14)	0.7670‡ (2)

gional origin and if the number of significant indicators is examined. In addition, when looking at the rank of the indicators on the individual market segments, it becomes clear that the US indicators are much more important for financial markets than the German ones although the ratio of significant indicators is the same for both markets. In the bond market the ranks of US indicators range from 1 to 16 while the German ranks range from 9 to 21 with the Europeans ranging from 15 to 22. Correspondingly, in the equity market the US indicators range from 1 to 14, the German ones from 11 to 17 and the European ones from 16 to 18. Finally, in the FX markets the US indicators range from 1 to 14, the German ones from 4 to 17 and the European ones from 18 to 19. Considering that Germany has only 5 significant indicators while the US has 15, it becomes obvious that there is a clear ranking between the regions: US indicators are most important, German indicators are middle important and European indicators are least important.

Finding 4: Economic theory can explain differences in the importance of indicators.

Many of our results can be explained by economic theory. Classic economic theory tells us for example that inflation has a high impact on interest rates. As interest rates are the main pricing source for bond markets, inflation related economic indicators should be of particular importance for bond markets and of subordinate importance for our other two markets. Consistently, Consumer Price Index and Monetary Aggregate should be very relevant especially for the bond market. Our results confirm this economic conclusion as the US Consumer Price Index is of outstanding importance for the bond market and of lower importance for the other two markets (bond market: rank 3; equities: rank 9; FX: rank 15). Corresponding to that, the most relevant German indicator in the bond market is the German Monetary Aggregate while this indicator is of subordinate national importance for the other markets (bond markets: rank 3; equities: not significant; FX: rank 15). Its European counterpart, the European Monetary Aggregate, confirms this observation, too (bond markets: rank 15; equities: not significant; FX: not significant). The high impact of inflation related indicators on bond markets therefore seems to be in-line with classical theory.

Another good example is the trade balance. It quantifies the excess demand (or supply) for a currency on the basis of goods and services. By classical economic theory, prices are the result of demand and supply. So

the direct impact of the trade balance, especially on FX markets, is obvious. Therefore it is not surprising that the US trade balance has rank 2 for its impact on FX markets, but only rank 14 for equities while it shows no significance for the bond markets. Correspondingly, the EU trade balance is the most relevant European indicator only for the FX market and not for the other two markets.[35] This high importance of the trade balance seems to be also in-line with classical economic theory.

The high importance of the US Labor Market Report can as well be attributed to rational reasons. Economic analysis distinguishes between three sectors: the production side, economic demand and inflation developments. If production increases, work demand also increases because corporations need more man power. On the other side, if more people are employed, the sum of salaries in an economy rises, which leads to an increasing demand for goods. And inflation is the additional key figure in economic analysis, which is also covered by the Labor Market Report by its numbers for average earnings per hour. The Labor Market Report therefore informs about all economic sectors and is one of only few nationwide US indicators that do so. Only the US Gross Domestic Product and to a smaller extent the US Manufacturing ISM Report of Business have similar information content. Corresponding to this, these three indicators are the only steady members of the TOP-5, independent of the market segment we look at. Markets therefore seem to be influenced mostly by indicators that bring the most economic relevant information, which is consistent to economic theory.

The conformity of our results with classic economic theory can not only be found when indicators are of special importance on single markets. Moreover this conformity can also be identified on rather unimportant indicators. According to the Efficient-Market-Hypothesis, all public information is already priced in the markets and therefore indicators with no unique but only redundant information can have no impact on the markets. This may explain why the German and Euro Labor Market Reports have almost no impact while the US Labor Market Report is the most important indicator of our survey. In contrast to the US Labor Market Report the key results of the German Labor Market Report are regularly leaked hours prior to the official release date and thus the German Labor Market Report is not very relevant on financial markets.[36] The

[35] The German trade balance is not included in our analysis as its release dates could not be found out.

[36] See *Anderson/Hansen/Sebestyén* (2006), pp. 39–41.

Euro Labor Market Report however is not leaked early, but as it is calculated with the prior released national Labor Market Reports in Europe, this aggregation cannot bring much new information. Therefore the European Labor Market Report is also of negligible importance though the US results clearly indicate how important Labor Market Reports can be. More indicators can be found to which the latest rational applies. For example, the US Leading Economic Indicators, published by the Conference Board, are calculated with ten other leading indicators. Of these ten indicators eight are already released prior to the release of the US Leading Economic Indicators.[37]

Many of our results therefore indicate that markets can be rather rational when interpreting fundamental indicators. But not all of our results fit into what may be expected in-line with classical theory.

Finding 5: Behavioral aspects seem to play a role in the importance of indicators.

One sign for a behavioral classification of economic indicators by market participants is that there seems to be a relationship between the duration that an indicator already exists and its importance. For example, the US Philadelphia FED Index and the US Empire State Manufacturing Survey are roughly-said identical indices. Both are released by a state's Federal Reserve Bank, both ask nearly the same questions and so both should be of similar information content. However, as the US Empire State Manufacturing Survey is released strictly before the US Philadelphia FED Index, one would expect the former to be of more importance. In contrast to that, the latter is significant on all markets (with rank 9 on FX market and ranks 4 and 14 on the others) while the former is only of significant importance on the FX market (with rank 10). Thus the US Philadelphia FED Index is clearly of more importance. We argue that a very reasonable argument for this is the longer history of the US Philadelphia FED index. It is calculated since 1968 while the US Empire State Manufacturing Survey is calculated since 2001 only.[38] As the information content of an index, however, is independent of its own history, rational market participants should judge an indicator only by the new information it brings but probably do not.

[37] Prior to 2001, all ten indicators were known in advance. See *Mattern* (2002) pp. 75–86, and *Mattern* (2005), pp. 338–351.

[38] For the history of these indicators see *Mattern* (2002), pp. 98–103, and *Mattern* (2005), pp. 322–337.

Another good example for this phenomenon comprises the German ifo Business Climate Indicator and the German ZEW-Index. Both are often regarded as comparable, however the German ifo Business Climate Indicator is significant on all markets while the ZEW-Index is consistently insignificant. As the ZEW-Index is calculated since 1991 and the ifo Busincess Climate Indicator since 1949, this pair of indicator additionally supports our observation.

The pattern how indicators are released also seems to have an interesting interdependence with their importance. Corresponding to this, the most important German indicator (the DE ifo Business Climate Indicator) is the only significant German indicator with a fixed and publicly known release schedule while the other relevant German indicators are released only with short notice and at changing times of day. It may also be possible that the high relevance of the US indicators is a product of the standard US release practice where at the end of a year a dedicated release time for every indicator with its release dates for the whole subsequent year is announced. In contrast to that, the German indicators are released more randomly as described above. This could also contribute to the fact that many US indicators are more important for the German equity market than the German indicators. But as there are some indicators with fixed release times and only limited impact on the markets, it seems that this is only a necessary but not sufficient condition to explain the relevance of an economic indicator. This can best be seen with the ZEW-Index, which is published at a fixed time table that is known in advance. However, we found no significant impact of this special indicator on any of the three markets we looked at.

It seems that with the representative heuristic, which shows how market participants can systematically overestimate the importance of particular indicators, an interesting result of our analysis can also be explained very well.[39] In our study two US indicators about new orders are included: the US Durable Good Orders and the US Manufacturing New Orders. Surprisingly, the latter is almost irrelevant (least relevant US indicator in the bond market and insignificant in the other two) while the former is of relatively high relevance for all markets although both have similar news potential. Durable Good Orders however are, in contrast to regular orders, highly volatile as there are often large orders in one month followed by months without large orders. This surprises the markets very often and, corresponding to the representative heuristic, people

[39] See *Kahnemann/Frederick* (2002) for the representative heuristic.

will ceteris paribus attribute more relevance to the higher volatile indicator.[40] Market participants obviously believe that they can predict future economic developments with this volatile information about durable good orders because they think that this data is representative for the coming data. As the value of the total US Manufacturing New Orders is nearly twice as large as the US Durable Goods Orders this is not well explainable with rational arguments.

Finally, behavioral arguments seem to be necessary to explain the extraordinary importance of the US Labor Market Report. In Finding 4 we have described that this report is one of the few nation-wide indicators that incorporate joint information about the three crucial economic categories (demand, supply and inflation). However, the US Gross Domestic Product and, to a lesser extent, the US Manufacturing ISM Report of Business do the same, and, knowing this, it cannot be explained why the US Labor Market Report is persistently of more than double importance than the indicator ranked second, which makes the US Labor Market Report of outstanding importance.[41] Behavioral Finance can help to explain this extraordinary importance. The concept of framing explains that the manner in which information is presented can bias investment decisions and therefore has the potential to influence the importance of indicators.[42] Regarding this, it is interesting to note that the main information of the US Labor Market, the newly created jobs outside the farm sector (the so-called new non-farm payrolls), is reported as absolute values. Monthly changes are therefore also reported as absolute changes. This is very unusual for economic indicators as typically changes are presented as relative changes in percents with one decimal only. Market participants might therefore regard the US Labor Market Report as of outstanding accuracy and interpret its results correspondingly. Additionally, a tiny relative change in the number of new non-farm payrolls is equivalent to a high absolute fluctuation.[43] The standard deviation of the abso-

[40] See *Mattern* (2005), pp. 287–293.

[41] For the US Gross Domestic Product it can at least be argued that this report is of less importance because it can be approximated by other indicators that were released earlier. However the US Manufacturing ISM Report of Business is mostly released before the US Labor Market Report and is still far less important than the US Labor Market Report.

[42] See *Tversky/Kahnemann* (1981) for framing.

[43] For example, a change of .1 percentage points in the number of new non-farm payrolls equals approximately 138.000, which is exactly the average value of the monthly new non-farm payrolls since 1990 with a standard deviation of 166.000.

lute number of new non-farm payrolls is for this reason rather high and, corresponding to the representative heuristic described above, this may be a secondary reason for the extraordinary high importance of the US Labor Market Report.

Finding 6: Only some observations seem to be beyond classical and behavioral theory.

We have already described rational and behavioral arguments for the importance and unimportance of indicators. For most observations it is therefore possible to find arguments that seem to be able to explain our observations. However one indicator is of noticeable low importance-namely, the German ZEW-Index, and we cannot see a possible explanation for the unimportance of this indicator. We have described why this indicator might be of less importance than its often regarded counterpart (the German ifo Business Climate Indicator), however we can see no rational why the ZEW-Index is of no importance at all on any market.

Additionally, we see that US indicators are generally more important than indicators from other regions. For sure one can say that the US business is the most important in the world and this causes a high importance of its indicators. Why German and European indicators are, however, less important for the financial markets in Europe than their US counterparts is certainly not easy to explain with rational arguments, and fitting behavioral arguments, as we made above, might exist but are not obvious.

V. Conclusion and Outlook

Our study provides many insights into the importance of economic indicators on the various segments of financial markets. These insights can be useful for researchers as well as for practitioners. For example, our survey exhibits that market participants do probably not agree about the importance of economic indicators and are home biased; therefore our study can surely provide new information to them. The discussion about the potential reasons for the importance of economic indicators may also bring benefit to producers of economic indicators if they are interested in the effect of their indicators on financial markets. In general, our results contribute one part to the understanding of financial markets.

Next to the understanding of markets, our results can also be useful for investors in a monetary way. Short-term traders who invest during only a

couple of seconds while trying to exploit the movements of markets directly after the releases of indicators are for sure interested in which indicators do matter at all and which are most relevant. However we have signs that also longer-term investors can capitalize on the knowledge of the effects of indicators. For example, if an investor would have always anticipated perfectly the 5-minute movement of the DAX after the release of the US Labor Market Report, that investor would have gained a mean return of 42bp. This return is obviously only virtual as we all know how hard it is to predict the direction into which markets move at the release of an indicator. But if an investor would only invest 5 minutes after (!) the release of the US Labor Market Report in that market direction that he observed the market went within these 5 minutes, he would still earn an additional 14bp over the following 60 minutes. In other words, the US Labor Market Report seems to affect the markets for longer than 5 minutes and this might eventually be exploited. The proof for that is far beyond the scope of our study and might be done in future research.

More questions arise that seem to be interesting for future research. First, it is not clear which factors drive the importance of economic indicators on financial markets. It would be interesting to see whether a quantitative model can be found to rate the importance of economic indicators. Second, we have not tested whether the importance of indicators is more or less stable or if it is changing throughout time. For example, one could analyze whether the importance of indicators changes throughout the business cycles or according to prevalent topics that are of special interest ("hot topic") at the markets in special phases. Therefore, although the field of economic indicators has been researched for years, there is still much work to be done.

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Summary

Which Fundamental News Moves the Markets?

Fundamental News and its Impact on Equity, Bond and Foreign Exchange Markets

We study the impact of economic indicators on financial markets and their varying importance for the main financial segments, i. e. stocks, bonds and FX. Indicators from the USA, Germany, and Euro zone are included while market data for the German stock market (represented by the DAX-Index), the European benchmark bond market (represented by the Bund future) and EUR-USD is being used. Next to identifying the economic indicators with the power to move the market we also discuss why some indicators seem to be more relevant than others. Our key

results are: a) the US Labor market indicator is by far the most important indicator; b) the importance of an indicator can generally be prejudged by its origin; c) differences in the importance of indicators can be explained by economic theory; d) behavioral aspects also seem to play a role in the importance of the indicators; and e) only some empirical observations seem to be beyond classical and behavioral theory. (JEL G15, G24, D03)

Zusammenfassung

Welche Fundamentaldaten beeinflussen das Marktgeschehen?

Fundamentale Nachrichten und ihr Einfluss auf Aktien-, Renten- und Währungsmärkte

Wir untersuchen den Einfluss von Konjunkturindikatoren auf die Finanzmärkte und deren unterschiedliche Bedeutung für die einzelnen Segmente Aktien, Renten und Währungen. Dabei berücksichtigen wir Indikatoren aus den USA, Deutschland und der Eurozone. Als Marktdaten verwenden wir den deutschen Aktienindex DAX, den Bund-Future als Benchmark für den europäischen Rentenmarkt sowie EUR-USD. In der Untersuchung identifizieren wir diejenigen Konjunkturindikatoren, die Finanzmärkte beeinflussen. Darüber hinaus diskutieren wir, warum einige Indikatoren eine höhere Bedeutung haben als andere. Die Kernaussagen der Untersuchung sind a) der US-Arbeitsmarktbericht ist bei Weitem der wichtigste Konjunkturindikator, b) die Bedeutung eines Indikators hängt im Allgemeinen von seiner geografischen Herkunft ab, c) Unterschiede in der Bedeutung der Indikatoren können mithilfe der ökonomischen Theorie erklärt werden, d) behavioristische Aspekte spielen ebenfalls eine Rolle bei der Bedeutung der Indikatoren und e) nur wenige empirische Beobachtungen scheinen nicht durch die klassische oder behavioristische Theorie erklärbar zu sein.