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ROCKING THE EURO BOAT: SCHEDULED MARKET ANNOUNCEMENTS' EFFECTS ON EURO IMPLIED VOLATILITY

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ABSTRACT

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Title:	Rocking the Euro boat: Scheduled market announcements' effects on Euro implied volatility
Faculty:	LUT School of business
Major:	**Finance**
Year:	2011
Master's thesis:	82 pages, 31 graphs, 11 tables, 2 pictures, and 9 appendixes
Examiners:	Prof. Minna Martikainen Prof. Eero Pätäri
Keywords:	implied volatility, option theory, event study, monetary policy

The purpose of this thesis is to investigate scheduled market announcements' effects on Euro implied volatility. Timeline selected for this study ranges from 2005 to 2009. The method chosen is so-called event study approach, in which five days prior to a news announcement stand for a pre-event period, and five days after the announcement form a post-event period. Statistical research method employed is Mann-Whitney-Wilcoxon test, which examines two evenly-sized distributions' equality, in this case the distributions being the pre- and post-event periods. Observations are based on daily data of US dollar nominated Euro at-the-money call options. Research results partially back up previous literature's view of uncertainty increasing prior to the news announcement. After the exact contents of the news is public, uncertainty levels measured by implied volatility tend to lower.

TIIVISTELMÄ

Tekijä:	Ari Syrjälä
Tutkielman nimi:	Ajoitettujen markkinauutisten vaikutukset euron implisiittiseen volatiliteettiin
Tiedekunta:	Kauppatieteellinen tiedekunta
Pääaine:	**Rahoitus**
Vuosi:	2011
Pro gradu -tutkielma:	82 sivua, 31 kuvaajaa, 11 taulukkoa, 2 kuvaa ja 9 liitettä
Tarkastaja:	prof. Minna Martikainen prof. Eero Pätäri
Hakusanat:	implisiittinen volatiliteetti, optioteoria, tapaustutkimus, rahapolitiikka

Tämän tutkielman tarkoitus on selvittää, millainen vaikutus ajoitetuilla markkinauutisilla, joiden tarkkaa sisältöä ei vielä tiedetä, on euron implisiittiseen volatiliteettiin. Tutkimuksen ajanjaksona on käytetty vuosia 2005–2009. Tutkimus on toteutettu niin sanottuna tapaustutkimuksena (engl. event study), jossa tiettyä markkinauutista edeltävät viisi kaupankäyntipäivää muodostavat pre-event -jakson ja vastaavasti viisi uutisen jälkeistä kaupankäyntipäivää post-event -jakson. Tilastollisena menetelmänä on käytetty Mann-Whitney-Wilcoxon -testiä, joka tarkastelee kahden yhtä suuren jakauman, tässä tapauksessa pre- ja post-event -jaksojen, samankaltaisuutta. Havainnot perustuvat yhdysvaltain dollareissa noteerattujen osto-optioiden, joiden kohde-etuutena on euro, päivittäiseen hintadataan. Optiot ovat niin kutsuttuja at-the-money -optioita. Tutkimustulokset ovat osin yhteneväiset aiemman aiheesta tehdyn tutkimuksen kanssa. Epävarmuus tyypillisesti nousee juuri ennen tiedonsaantia. Kun markkinauutisen tai -ilmoituksen tarkka sisältö on tullut julkisuuteen, implisiittisellä volatiliteetilla mallinnettu markkinaepävarmuus tyypillisesti alenee.

Preface

This Master's thesis took a while to deliver.

The primary reason for the delay was my sudden transfer from a full-time student to a full-time finance professional. This metamorphosis was all but easy, including moving to Helsinki, where a vast majority of this thesis was written.

Looking back, I see an extensive amount of work done with my studies and this thesis. Throughout the way, several people have contributed to the fact I am finally writing these very words.

I would like to express my most humble gratitude to my parents for supporting me in a number of ways through my path of studies. As for this thesis, I would like to thank my supervisor, Professor Minna Martikainen for her invaluable comments, patience, and support, as well as Messieurs Ville Matikainen and Jussi-Pekka Manner for their technical assistance with SPSS software. Also, Mr. Mikael Kovero deserves a bow in the waist for his comments on my research setup.

And Noora, thank you for giving me my wings.

Helsinki, 30th October, 2011

Ari Syrjälä

Contents

1. Background and motivation

The future volatility of an asset's price can be assessed using historical price information, the information provided by option prices, or the combination of the two. This is, however, a challenging task. Numerous traders and researchers have aimed at forming an ultimate trading strategy based on options, which, is employed effectively, would result in major abnormal returns as option trading employs a so-called leverage effect: a rather modest amount of capital invested can generate spectacular returns. In addition to all historical information, option traders have other information about future events that may be relevant. As a result, option implied volatilities are potentially the most accurate forecasts.

1.1 An era of financial distress

Throughout the recent years of financial turmoil, the ignition of which were sub-prime mortgages in the US but the seed had been sowed a long time before, market announcements have received vast attention. This amount of interest was something experienced never before. Furthermore, in times of modern technology and the internet, all the news spread around the world instantly.

From this frame of reference, studies focusing on changes in the nature – be it a concrete quality or merely a psychological perception – of financial and foreign exchange markets have an eminent value: are the financial instruments markets never going to be the same again? Or are we facing the dawn of a new era of suspicion and mistrust, two qualities most noxious for financial markets?

Financial crises cannot be interpreted merely based on financial theories. After all, investor behaviour is a far cry from what rational market theory suggests, namely a phenomena called bounded rationality being one of

the major forces driving investors and especially foreign exchange markets.

Together with a socio-economic approach, fundaments of the US private consumption – including the record low private savings rate implying a hugely debt-driven consumption structure – play a significant role. As noted by Rötheli (2010), the ones to blame on the evolution of the recent crisis are not the average American consumers, but the politicians and their decisions to overly support home ownership by excessive lending even to clients not able to pay back their mortgages.

Furthermore, as noted among others by Rötheli (ibid.), private consumers were not the only market participants with their rationality bounded. The term “credit cycle”, referring to banks' tendency to increase their credit supply during the upswing and to strongly cut down lending during recessions, showed its full force as major banks were driven to excessive risk taking during an exceptionally long economic boom. Looser terms on mortgage loans, together with a custom of investing in non-balance sheet Special Investment Vehicles, or SIVs, resulted not only in greater amount of risks but also these risks becoming more invisible.

However, a single bank under such circumstances of extensive competition during an economic boom faces two options: either to increase its exposure to greater risks in order to achieve a broader customer base and higher returns or being marginalized by its bolder competitors. In this point of view, Rötheli (2010) backed up Rajan's (1994) findings of (US-based) banks' risk appetite during economic upswings.

Both authors (Rötheli, 2010; Rajan, 1994), a socio-economist and a finance researcher, conclude that investment banks operate and make decisions based on individual incentives, the level of which, in turn, is closely related to economic cycles. During a boom, there is a clear incentive for risk appetite, and vice versa. Moreover, they both end up concluding that bank managers with short horizons will set credit policies

that influence and are influenced by other banks and demand side conditions (ibid).

This thesis focuses on major macroeconomic news' effects on market assumptions about the future risk of Euro as an investment. This risk is measured by implied volatilities calculated using dollar-nominated Euro option contracts. Timeline for this study follows news archive dates indicating major market news release dates, ranging from January 2005 to December 2009.

Traditional option pricing theory suggests that options markets reject market participants' expectations of future asset price volatility by considering underlying asset's volatility constant over time. The theory offers implied market volatility as a risk measure which not only reflects ex ante risk expectations but also has an impact on option prices. Therefore, shocks in implied volatility are crucial with respect to stock market and option market price formation and to hedging strategies using derivative securities.

1.2 The purpose of this study

The main purpose of this study is to examine whether or not various macroeconomic news factors affect market participants' view of the future in terms of Euro currency risk by employing an event-study based methodology and Mann-Whitney-Wilcoxon test of distribution similarity. Analysing various market news announcements' effects on asset prices lies at the heart of empirical finance literature concerned with market efficiency and market microstructure. This study is about to bring in another point of view to assess market efficiency.

Practical importance of this study links to four main attributes of present financial markets. Firstly, as the foreign exchange markets become more and more integrated, also market news announced and policy implications committed affect everyday lives of traders and other people around the world. This effect is most clearly visible in future Euro prices deriving our purchasing power relative to non-Euro countries, together with export-based national economies affected by strengthening or weakening currency. Secondly, during the times of financial crisis, this study provides additional information about foreign exchange derivatives market, its delicate balance, and behavioural nature.

Thirdly, the foreign exchange market being the largest financial market in the world, understanding its movements and their effects on national economies is of a great importance. The results of this study have important implications for option traders who need to better understand the behaviour of implied volatilities for valuation purposes.

Fourthly, market speculators and traders may also be able to find these study results beneficial, since if option prices, driven partly by implied volatility, tend to move in a certain manner around a certain type of event, a trader with a right timing would be able to reap a profit.

Implied volatility is a forward-looking risk measure essentially containing not only all past information about the underlying but also market participants' average, or weighted average, view of the future. Furthermore, as several studies have shown, implied volatility figures outperform many traditional backward-looking, conditional methods employed in future asset price prediction.

Theoretically, this study is to provide further background for implied volatility applications in times of global financial turmoil. This is being executed by combining existing literature of both previous IV studies and market news effects research.

An analysis of existing literature shows that no significant papers combining the topic and event study methodology approach have been published. Instead, monetary policy effects on stock returns, bond yields, and interest rates have received vast attention, as have comparisons of implied volatility versus regression-based modelling in predicting future spot asset prices. If markets for foreign exchange are effective, implied volatility should be able to predict future exchange rates, or at least the future direction of their movement, since all available information should be included in option prices.

Across a time line ranging from the last months of the year 2008 until present, governments and central banks have employed various policies to boost weakening economies. Billions of several currencies, mainly US dollars and Euros, injected to the economy have formed a unique economic atmosphere.

Recovery packages launched by central banks cause foreign exchange investors, from large investments banks to private individuals, to take action in accordance with their risk appetite and market condition assessment. The direction for this action is closely linked to projected risk levels of the Euro.

Credit crisis' effects on international economy, financial markets, and business atmosphere as a whole have received a vast amount of news space. After a decade of strong growth, a growing number of European countries are struggling from the effects of relatively high current account deficits, elevated external debt levels, rapid credit growth, and a consumption boom financed by foreign currency borrowing. (World Bank, 1)

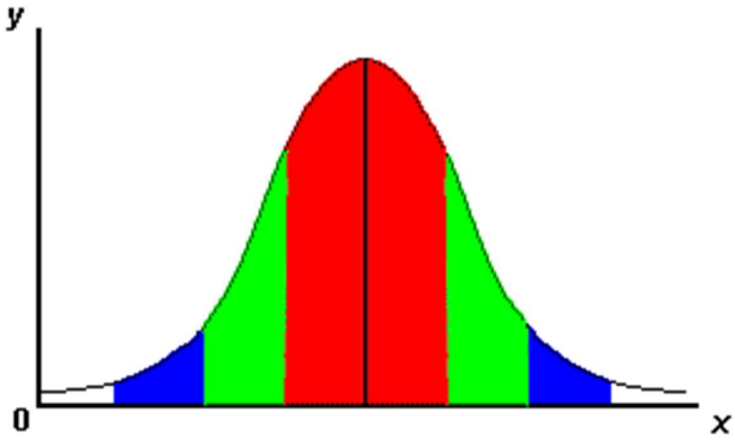
A start for this study is a review of Black-Scholes-Merton option pricing model, its implications and the concept of implied volatility. Implied volatility's usefulness as a proxy for future risk and its actual ability to forecast assets' future prices are being paid close attention to.

1.3 A theoretical background for the study

Two main guidelines to be followed in this study include the concept of volatility describing the amount of uncertainty of any future outcome, and macroeconomic structures affecting market participants through certain mechanisms.

The research problem this study faces is closely related to investors' actions when it comes to derivative prices in general and option volatilities in particular: what kind of an effect do various market announcements have on Euro implied volatility? By way of explanation: are there some announcements in the field of macroeconomics that affect investors' opinions, and if so, experienced *t+n* risk level of an asset. Additionally, if there is a different pattern of behaviour concerning Euro area and US news is under attention as well.

Volatility itself can be simply depicted as a level of variation around an expected outcome. Though usually labelled negative by investors and people in general, the very nature of volatility itself allows not only for negative outcomes but positive surprises as well. In other words, volatility measured typically by standard deviation or variance is often assumed identical by its bell-curve shaped dispersion. Depending on an investment strategy, high volatility can even be desirable, implicitly allowing for higher profits through speculation.



Picture 1. Bell-shaped normal distribution

Picture 1 describes the pattern of volatility in terms of standard deviation. For any data sample, one standard deviation away from the mean – be it the expected return of an asset, for instance – in either direction on the horizontal axis represents an approximate of sixty-eight per cent of the entire population. This one-standard-deviation-range is being imaged by the red area in picture 1.

Similarly, the green and blue areas represent areas two and three standard deviations around the mean. Added to the red are, these two account for ninety-five and ninety-nine per cent of the total population, respectively.

Algebraically, standard deviation is most commonly calculated as follows:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

(eq. 1)

where

N = number of observations

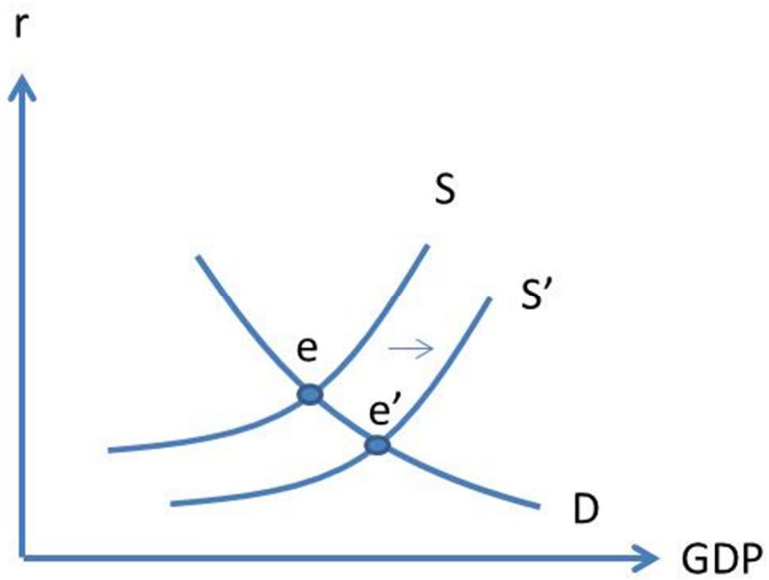
x_i = observation *i*

$\bar{x}$ = average value of observations

In the field of finance, volatility usually refers to the standard deviation of continuously compounded returns of an asset or a financial instrument. Typically, volatility is being measured using historical price data. In this sense, asset risk level assessment is closely related to technical analysis focusing on discovering potential patterns to gain benefits from.

Implied volatility, on the other hand, is a far more sophisticated method of uncertainty measurement. If assumed for efficient markets, or at least moderately efficient with no superior investment strategy based on technical price analysis, future uncertainty measured by market participants should represent the most accurate risk level yardstick.

As far as macroeconomic events go, this study focuses on monetary policy actions and other key figures for an economy's activity. The basic form of monetary policy actions contains alterations in prevailing key interest rates, namely the FED and the European Central Bank offer rates. These two figures form the basis on all the other loan rates and are, therefore, presumably the most important single factor dictating economic activity in a national economy.



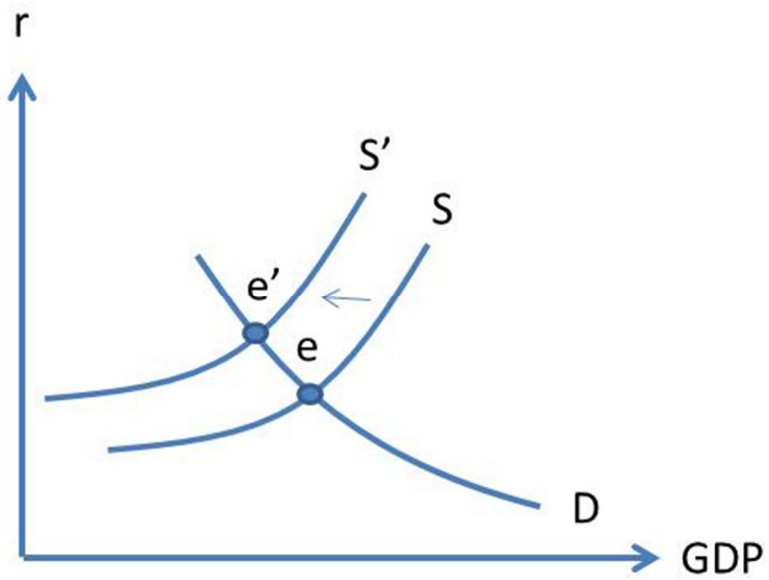
Graph 1. Economy-expanding monetary policy

Graph 1 illustrates the mechanism behind the economy-boosting effect of interest rate cuts. Vertical and horizontal axes represent levels of interest rate and a nation's gross domestic product, respectively.

In a case of economy-expanding monetary policy action, a central bank typically commits an open market operation of buying government bonds from the public. In effect, the economy's money supply expands, which results in a lower interest rate and, ceteris paribus, a positive change in GDP. In Graph 1, this change is being illustrated by the movement of the money supply curve *S* into a new position *S'*. In the process, the original equilibrium *e* moves to *e'*. The new equilibrium of money supply and demand is found at a lower interest rate r and a higher level of GDP. Thus, a central bank operation resulted in an expansion of the economy.

Economy-expanding open market operations are typically employed to boost a weakening economy. On the other hand, to prevent a national economy from overheating, central banks employ economy-diminishing actions by selling government bonds and thus decreasing the amount of money in the economy. This results in a higher level of interest rate and,

ceteris paribus, a lower level of GDP. Economy-diminishing actions are usually taken to control price inflation. Graph 2 describes the process graphically.



Graph 2. Economy-diminishing monetary policy

In Graph 2, central bank's action to sell financial assets diminishes the amount of money in the economy i.e. its money supply. The new equilibrium found at *e'* indicates a higher level of interest and thus a lower level of GDP. Throughout the time frame of this study, mainly economy-expanding operations were committed by the Federal Reserve and the European Central Bank.

Intuitively, market participants are more likely to pay increased attention on monetary policy actions, together with other crucial macroeconomic news announcements during uncertain times in a national economy. This study's timeline ranging from a financial boom in mid-2000s to a deep plunge into a world-wide economic downturn in 2008 might deliver some backup for this intuition: higher movements in implied volatility around important news dates during the age of crisis compared to that of stable financial conditions would imply traders have become more aware – and afraid.

However, as noted among others by Bijapur (2010) and Adrian & Shin (2008), economy-expanding actions seem to lack significance during credit crises. An explanation by Adrian & Shin (ibid.) suggests that financial expansion committed by central banks do not necessarily result in a lower interest rate but are absorbed into banks' margins instead as they aim at lowering their leverage ratios. Thus, balance sheet reconstruction keeps the potentially beneficial effects of capital expansion away from the real economy.

Sager & Taylor (2004) studied policy announcements' effects on foreign exchange market volatility. They imply that the EBC governing council's (GC) announcements of interest rate decisions include a significant amount of data worth paying attention to by financial markets. Their study covers GC meeting days from 2002 and 2003, the evidence suggesting that there are both statistically and economically significant effects related to these announcements through alterations in traders' behaviour.

Moreover, as concluded by Hutchinson et al (2010), the actual outcomes of monetary policy interventions vary. Their study, covering emerging markets and developing countries' financial conditions in terms of balance of payments during what they label "a sudden-stop balance of payments crisis", also paid attention to exchange policy. Thus, their study results are of an interest from this study's point of view, as the global financial crisis generated conditions that can easily be summed up as "a sudden-stop crisis."

Hutchinson et al's (ibid) key findings include uncertain sequences of political interventions. For example, during a crisis in Latin America in the 80s, both Bolivia and Chile reacted to a sudden crisis by taking political actions. However, even though Bolivia's decisions included contracting both monetary and fiscal policy (see Graph 2), and Chile held its policy and key interest rates somewhat stable, both countries experienced a sudden drop in their GDP: Bolivia on the order of 24 per cent, Chile of 28 per cent. A similar pattern existed, according to the authors (ibid.) in 1994

and 1997, on the first of which Venezuela expanded its monetary base but held its fiscal policy steady, and on the latter year Malaysia took the actions the other way around. At the end of the day, both countries ended up with sharp declines in their output and GDP.

These examples are to demonstrate the behavioural nature of financial markets together with numerous factors affecting market reactions no researcher is able to control or fully take into account. For this study, this is both a restriction and an opportunity: on one hand, despite the careful selection of event window and the variables under attention, several other factors out of control may also play a significant role. On the other hand, it is exactly this intuitive irrationality what makes this kind of a study interesting and important.

When studying monetary policy interventions employing high-frequency intra-day data, Hussain (2011) found that ECB's press conferences preceding monetary policy actions committed the same day have significant effects on Euro index return volatilities. Clearly, he suggests that the availability of high-frequency data is crucial as distinctions between monetary policy actions and other macroeconomic news factors would otherwise become, perhaps, next to impossible or at least far less reliable. Data frequency level is consistent to that of Sager & Taylor's (2004).

Hussain (2011) focuses solely on “surprise” actions taken by the ECB. By definition, these actions are non-scheduled and as such approach the question of macroeconomic announcements' effects from a different angle than this study. However, his findings support a commonly agreed principle of only surprising monetary policy having an effect on markets. According to his findings, surprising actions increase the level of volatility in European stock markets. Furthermore, the ECB press conferences held 45 minutes after the monetary policy news appear to make a significant difference, in a sense that it appears to bring about more incremental

information to market participants than monetary policy announcements alone.

The empirical question investigated in this study is in what way, and in what magnitude, do monetary policy announcements and other major macroeconomic news factors both in the US and Europe affect Euro's implied volatility structure. A close sequel to this question is to analyse whether Euro volatility is more sensitive to European than US news. Intuitively again, the original source of news should not have an effect on a change in implied volatility, given the global financial markets' ability to price the risk accordingly.

The statistical hypothesis of this study suggests an indifference between the pre-event and post-event periods considering their volatility structure, both having the same length in days and included in the event window:

$$H_0: \sigma_{Post}^{Eur} = \sigma_{Pre}^{Eur}$$

(eq.2)

$$n_{post}^{Eur} = n_{pre}^{Eur}$$

(eq.3)

where

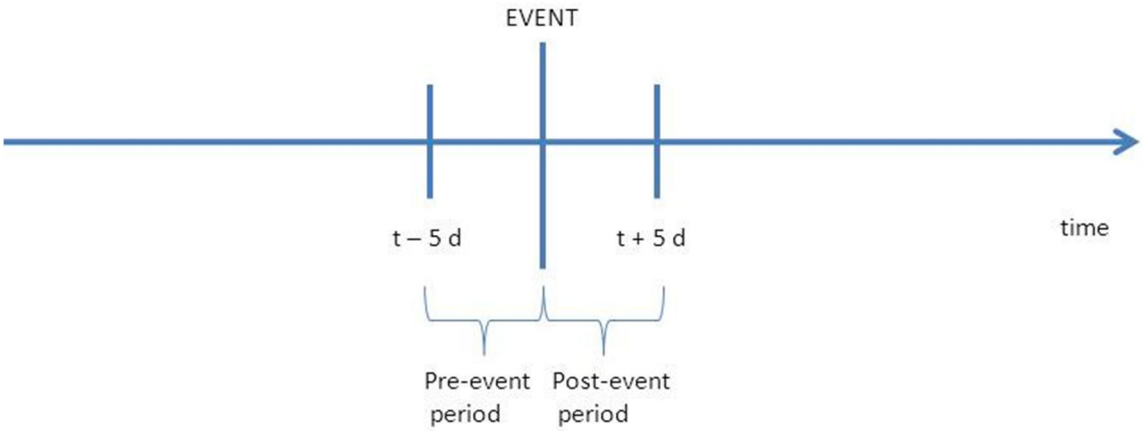
σ_{Post}^{Eur} = an implied volatility of a pre-event period

σ_{Pre}^{Eur} = an implied volatility of a post-event period

n_{post}^{Eur} = a number of observations included in a post-event period

n_{pre}^{Eur} = a number of observations included in a pre-event period

In all pre-event and post-event cases, *n* equals five, similarly to the study conducted by Morel & Teiletche (2008) described in more detail below. Consistent with Ederington & Lee (1996) and Kim & Kim (2003), practical hypothesis for this study suggests the implied volatility to fall right after scheduled announcements, once the uncertainty about the announcement content is gone. Picture 2 shows a graphical illustration of the event study methodology.



Picture 2. Event study methodology

1.4 Thesis structure

The first chapter has introduced the background for this study, together with the most crucial research problems. Moreover, it has covered the basics of this study's methodology. Further details about the actual methods selected will be introduced below.

In chapter two, previous research results on the topic are being analysed and a literature synthesis constructed. Furthermore, this section deals with definitions behind the factors and events.

Chapter three points out potential limitations concerning this study in general. The fourth chapter describes the research methodology in detail, introducing an insight into statistical methods employed throughout the empirical part.

Chapter five includes the research itself, focusing on scheduled market news and their effects on Euro implied volatility. In this section, the most significant results are being focused on. Chapter six and seven summarize the research results and aim at drawing a conclusion, together with topics for further research on the field of implied volatility and macroeconomic news events.

2. Literature review & theoretical framework

When analysing existing literature of the topic, two main guidelines and viewpoints arising from previous studies are being focused on. First of all, existing research papers on implied volatility implications are being reviewed. Secondly, results from market announcements' effects on several economic and financial indicators, also including interest rates and equity prices, have been taken into account. The last subchapter aims at forming a synthesis.

2.1 Previous research on implied volatility

Traditionally, implied volatility research has focused on the future structure of equity prices and returns' volatilities, together with implied volatilities' ability to predict future realized volatilities. Stock markets implied volatility has been previously studied among others by Wagner & Szimayer (2004), Nikkinen et al (2004, 2006), and Chen & Clements (2007) predicting power by Pong et al (2004), Becker et al (2007), Yu et al (2009), and Neely (2009). Clyde & Gislason (1995) formed a trading strategy employing currency options' implied volatility and tested wether or not it was possible to generate abnormal profits through the procedure.

In their study of implied volatility and spillover shocks, Wagner & Szimayer (2004) studied international market integration between the US and Germany. In their study, volatility peaks had a country-specific nature with only some evidence of volatility spillovers. Their data consisted of equity prices. The authors' findings included “positive jumps”, or increased volatility, around both scheduled and non-scheduled market news. Implied volatility moves around scheduled market announcements and news factors have received vast attention amongst the academy, yet non-scheduled news' case is far more complicated.

Related to Nikkinen & Sahlström (2004), Chen & Clements (2007) studied scheduled FOMC (Federal Open Market Committee) board meetings' effects on stock market implied volatility. Where Nikkinen & Sahlström (2004) found the implied volatility rise prior to a news announcement and fall sharply afterwards, Chen & Clements (2007) came up with results indicating that no matter what the board decision about US monetary policy, the VIX index representing the S&P 500 implied volatility plunged by approximately two per cent on the day of the board meeting. Furthermore, they did not report a rise in the index prior to the event. According to Chen & Clement's (ibid.) results, a market anomaly related to the behaviour of VIX index appears to prevail.

Kim & Kim (2003) expanded implied volatility research to cover foreign exchange markets by analysing scheduled news factors' effect on implied volatility of currency options with currency futures as the underlying asset. Prior to their study, not much emphasis had been put on the issue.

According to Kim & Kim (ibid.), whenever foreign exchange rate between two currencies is under heavy fluctuations, implied volatility calculated from foreign exchange options tends to peak. This peak is to take place regardless of the direction of the fluctuation. In other words, both the larger appreciation and depreciation of US dollar against foreign currencies would bring the higher implied volatility.

In their research of market announcements' effects on implied volatility, Kim & Kim (ibid.) found that scheduled macroeconomic announcements have no effect on implied foreign exchange volatility; in fact, implied volatility is to remain unchanged or decline from the day prior to an announcement. Interestingly, implied volatilities tend to significantly low on Mondays and significantly high from Wednesdays through Fridays. According to the authors (ibid.), this phenomenon is caused by traders' tendency not to take positions in the beginning of a week, their activity level rising significantly towards a weekend. The reasons behind the tendency, however, are paid attention to.

Differing from Kim & Kim's (ibid.) study, where the underlying future contracts were treated as a stock paying a continuous dividend and an application of the original Black & Scholes (1973) option pricing methodology was employed, this paper's approach of using the currency exchange rate as the underlying allows for the usage of the very basic Black-Scholes-Merton model.

2.2 Scheduled news and macro factors to analyse

For market announcements' effects on foreign exchange market, a research paper by Ederington & Lee (1996) provides a base to start from. According to the study, the purchasing power index (PPI) and US employment report are the most relevant macroeconomic news factors to affect future volatility expectations. Ederington and Lee's (ibid.) sample consisted of Eurodollar, T-Bond, and Dollar/Deutschmark data. The authors also noted that unscheduled news announcements tend to affect the post-event period implied volatility, while scheduled announcements lacked this significance.

Consistent with Ederington & Lee's (ibid.), Harvey & Huang's (1991) list of macroeconomic factors analysed in their study of foreign exchange futures volatility included PPI and unemployment figures' announcements. On top of these numbers, Consumer Price Index (CPI), quarterly GDP data, monthly income and capacity utilization rate were included in the analysis. Vrugt (2009) added merchandise trade balance, retail trade, industrial production, and money supply into the list of macroeconomic news factors to be used in the study.

Ederington & Lee's (1996) research results have been backed up by several researchers. Bauwens et al (2005) analyse both scheduled and unscheduled market news announcements' effects of Euro/Dollar return

volatility. The main focus is on the volatility changes during so-called pre-announcement periods. Their key findings included significant change in volatility prior to a scheduled event, whereas no significant post-event changes occurred.

Further proof of implied volatility's tendency to reach its peak during the pre-event period is provided by Donders & Vorst (1996). They focused on company-specific, scheduled news' effects on implied volatility. They found that implied volatility rises on the pre-event period, reaches its peak just before the news release, and drops significantly – to a level even lower than a long-run level of implied volatility – afterwards. Among their findings, only on the event day itself were the prices of the underlying asset higher than expected.

On the other hand, no change in volatility structure was visible in a case of unscheduled news, rumours of central bank actions being the only exception. Interestingly, most news announcements in the study were not followed by an alteration in euro/dollar return volatility structure. (ibid.) This is to imply a well-informed and effective nature of financial markets, since pre-event information seems to be included in currency prices and thereby already in returns.

In their implied volatility study, Nikkinen et al (2006) focused solely on scheduled announcements with certain timing but uncertain content. Their study concentrated on global stock market reactions only. Both G7 and European countries not included in G7 are, according to the results, significantly affected by the US economy as far as macroeconomic news and equity prices are concerned.

As far as central bank interventions are concerned, Morel & Teiletche (2008) exploited an event study type of methodology when assessing Bank of Japan's public interventions and their effects on investor expectations. Perhaps the most important conclusion the authors made was the fact that significant effects took place only if an intervention came

as a surprise, clinging to the notion of monetary policy being effective only in such circumstances.

Bijapur (2010) investigated four separate credit crunches in the US, aiming at identifying whether the impact of changes in policy rates on GDP growth was less effective during them. Results indicate, as far as monetary policy actions are concerned, a diminished impact on GDP growth during a credit shortage. Bijapur's (2010) concluding remarks imply that during a financial crisis, attempts to boost an economy by easing up monetary policy, i.e. cutting down key interest rates lack significance compared to similar actions taken during an economic upswing.

Whether implied volatilities can be effectively used in predicting future commodity prices and exchange rates has been of great interest of both academics and traders worldwide. The issue has been lit by Yu et al (2009) who came up with results suggesting that implied volatilities of OTC-traded options have a predicting power superior to traditional GARCH-based time series modelling and methods based on historical volatility, as long as the trading platform is liquid enough. OTC-traded options' implied volatilities turned out to be more able to predict future commodity prices than those of exchange-traded ones, presumably due to a higher level of liquidity.

Taylor et al (2010) backed up Yu et al's (2009) study by their results of implied volatility-based model's better informational efficiency compared to a historical ARCH model. In 87 out of 149 cases studied, implied volatility turned out to predict future equity prices better than the ARCH-based model.

However, as far as Pong et al's (2003) study results are concerned, implied volatility's superior efficiency in predicting does not hold with currencies. With yen, D-mark and dollar tested against one another, implied volatility-based methodology appears to provide results as accurate as historical volatility for the one-month and three-month time periods only. For six-month horizon, time series forecasts based on past

perceptions outperform implied volatility-based methods. Despite these delimitations, Pong et al's (ibid.) research results appear rather mixed as the conclusions vary depending on the currency pair under attention. For example, between the pound and the yen, implied volatility seems to provide better results for all time spans exceeding one week.

Neely (2009) comes up with more pessimistic results as far as implied volatilities' future explanatory value for exchange rates goes. In his study, Neely tests whether implied volatility structures are of significance in terms of delta-hedging. As a key conclusion, implied volatility can be considered a conditional expectation of realized volatility under fairly stringent assumptions only. These assumptions, according to Neely (ibid.), include negligibility of volatility risk premium, which is regarded an assumption far too generalizing.

Furthermore, once tested against a group of model-based volatility forecasts, as is the case with a study conducted by Becker et al (2007), implied volatility is found to include no additional information not already included in a model. The authors focused on S&P 500 volatility index, or VIX. They note, however, that consistent with earlier studies, methods based on implied volatility outperform any single model.

According to Vrugt (2009), news announcements have little effect on implied volatilities, whereas certain conditional (GARCH) risk measurement variables are significantly affected. According to the author (ibid.), the discrepancy between implied and conditional static volatility mirrors the difference between spot markets and derivatives markets. This is to imply that if stock prices are affected but option prices are not, or if the affect is of a different magnitude, profitable trading strategies – exploiting an anomaly – could exist. For example, if negative news factors enter the market pushing down equity prices, relatively cheaper options could be employed to gain from a price drop in an underlying asset.

However, as noted by Vrugt (ibid.), abnormal returns generated around the announcement days by such trading strategies are being mitigated and

turned into negative once transaction costs are taken into account. This conclusion is consistent with the one of Kim & Kim's (2003): foreign exchange markets, as well as equity markets, are efficient in a sense that no abnormal profits can be derived from exploiting implied volatility information.

Clyde & Gislason (1995), on the other hand, provided test results supporting not only implied volatility's role as a proxy for an underlying asset's volatility for the entire lifespan of an option, but also introduced a trading strategy based on implied volatility. This strategy, focusing on currency options, turned out to be able to provide traders with abnormal returns. The strategy constructed was quite straightforward: at-the-money currency options' implied volatility was assessed against the average values of these options. Transactions consisted of selling (buying) an option when the month's observation was above (below) the average. A commonly known option trading strategy, a straddle, was opened by selling at-the-money calls and puts in equal amounts. This position was to be held until option expiration dates.

Applying this trading rule, the authors (ibid.) concluded that out of 40 cases studied and four different currencies included, positive abnormal returns were evident in all but one case. Moreover, their results were different from zero, that is, statistically significant, at 98 per cent confidence level.

Whether Clyde & Gislason's (ibid.) strategy is still valid is anybody's guess. Nevertheless, both academics and traders should be interested in implied volatility in a sense it actually provides information applicable for generating abnormal profits.

Selection of Euro for the currency under attention is not only because of its high importance for the European Union but also due to findings of Nikkinen et al (2006) about Euro's implied volatility structure's considerable effect on other European currencies, including the British pound. This is clearly an evidence of Euro's position as a dominant

European currency. Consequently, Euro implied volatility is considered to play a significant role from the point of view of the entire foreign exchange market in Europe.

With several previous researchers providing results indicating strong interdependence between US and European financial markets, it is considered fair to assume that also currencies and their predicted market movements have an interaction. However, as Donders & Vorst (1996) and Wagner & Szimayer (2004) concluded, volatility peaks and shocks may primarily be of country-specific nature.

2.3 A Synthesis

Summarizing the existing literature, a selection of events and their nature of scheduled or non-scheduled plays a significant role in research of implied volatility and its behaviour around news announcements. Unscheduled announcements are, according to previous authors, the ones most likely to have an effect on post-event volatility changes. Mixed results are provided by existing literature as far as scheduled news announcements' effects on pre-event and post-event volatility structure alterations are concerned.

Despite including various different results, previous literature on implied volatility can be summarized by concluding that compared to conditional GARCH and ARCH models, methods based on implied volatilities can provide additional information. Moreover, option markets seem to be fairly priced since virtually no profits can be achieved by taking advantage of implied volatility movements around an event, trading costs taken into account.

As a practical hypothesis of this study, significant changes in Euro/USD implied volatility structure is expected to exist around scheduled news with

uncertain content. Consistent with the literature, the implied volatility is expected to reach its peak just prior to an event, falling sharply afterwards.

2.4 Definitions

2.4.1 Black-Scholes-Merton option pricing model

The Black–Scholes-Merton formula gives the fair (no arbitrage) price for an European call option.

For a non-dividend paying stock, the option pricing formula is derived as follows:

$$C\ (S, t) = N(d_1)S - N\ (d_2)Ke^{-r(T-t)}$$

(eq. 6)

where

C = Call price

S = Spot price of an underlying asset

K = Excercise price of an option

e = continuosly compounding interest

T = time to maturity of an option

and

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)(T-t)}{\sigma\sqrt{(T-t)}}$$

(eq. 7)

and

$$d_2 = \frac{\ln\left(\frac{S}{K}\right) + \left(r - \frac{\sigma^2}{2}\right)(T-t)}{\sigma\sqrt{(T-t)}}$$

(eq. 8)

Black-Scholes-Merton (BSM hereafter) model is not merely limited to stock option pricing, however. Generally, it can be employed in price calculation for an option with an underlying asset not paying a coupon or interest. A modification of the basic BSM, first introduced by Black (1976) allows for dividends or other cash flows to be taken into account. This type of methodology was employed among others by Kim & Kim (2003), described in more detail below.

Derivatives market existed a long time before the BSM pricing method was founded. For centuries prior to the development of the Black-Scholes model, option buyers and sellers negotiated prices at which voluntary trade occurred. Mixon (2009) analyses whether the introduction of new,

centralized exchanges and formal pricing models fundamentally change the way options are priced.

Mixon's (ibid) results indicate that after the introduction of BSM model and the opening of the first centralized option trading platform the year after dramatically altered the volume of options traded. Primarily, he concludes, the opening of an exchange played a major role, whereas a model employable in pricing and hedging had a supporting role. Modern pricing models and centralized exchanges changed the culture, language, and perception of option trading, but they did not fundamentally alter pricing behavior in the option market.

2.4.2 Implied volatility

Calculated using the BSM option pricing model, implied volatility originates from the price fluctuation of an underlying asset. As shown in Equation 2, this volatility is the only source of uncertainty in option pricing since all other variables are easily available at public stock exchange data and interest rate quotes. Neely (2009) added that not only the change in underlying asset price but also the change in underlying asset price variance affects the implied volatility.

2.4.3 Alternative methods for implied volatility calculation

When assessing implied volatility of an option, the traditional BSM model has received some criticism. Basically, as noted by Li (2005), a need for iterative models and inability to solve a value for implied volatility without a root-finding program has given birth to various methods for implied volatility calculation.

Brenner and Subrahmanyam (1988), as well as Feinstein (1988) came up with a formula accurate when a stock price is exactly equal to a discounted strike price:

$$\sigma_{impl} \approx \sqrt{\frac{2\pi}{T}} \frac{C}{S}$$

(eq. 9)

where

C = Call price

S = Strike price

T = option time to maturity

Several studies focused at generating a reliable and accurate formula for implied volatility calculation have focused on a certain case of an option.

As his synthesis, Li (2005) ends up with a model useful in spreadsheet applications, for instance, valid for nearly all options in the market. Regardless of an option's remaining time to maturity or its moneyness – at the money, in the money, out of the money –, his equation seems to accurately calculate implied volatility.

The concluding formula is derived as follows (ibid.):

$$\sigma \approx \begin{cases} \frac{2\sqrt{2}}{\sqrt{T}}\tilde{z} - \frac{1}{\sqrt{T}}\sqrt{8\tilde{z}^2} - \frac{6\bar{\alpha}}{\sqrt{2}} \; if \; p \leq 1{,}4 \\ \frac{\tilde{\alpha} + \sqrt{\tilde{\alpha} - \frac{4\,(n-1)^2}{1+n}}}{2\sqrt{T}} \; if \; p > 1{,}4 \end{cases}$$

(eq. 10)

where

$$K = Xe^{-rT}$$

$$\rho = \frac{|n-1|}{(\frac{C}{S})^2} = \frac{|K-S|\,S}{C^2}$$

$$\propto = \frac{\sqrt{2\pi C}}{S}$$

$$z = cos\left[\frac{1}{3}cos^{-1}(\frac{3\alpha}{\sqrt{32}})\right]$$

2.4.4 Implied volatility smile

Using the BSM option pricing model, with implied volatility described as a function of the exercise price, one should obtain a horizontal straight line. This implies that all options for buying or selling the same underlying asset with the same expiration date, but with exercise prices differing from one another, should have the same implied volatility. This is not, however, what occurs in practice in option markets worldwide, as noted among other by Vagnani (2009).

The implied volatility presents a strong U-shaped pattern, as the call option goes from deep in-the-money to at-the-money and then to deep out-of-the-money, or as the put option goes from deep out-of-the-money to at-the-money and then to deep in-the-money.

Traditionally, studied among others by Stein (1989), long-maturity options' implied volatility is fully determined by a weighted average of the ones of shorter-maturity options and a mean reversion parameter. Contrary to Stein's view, Wang (2007) argues that the volatility of the underlying asset often suggests a lower level of mean reversion that would be interpreted based merely on Black-Scholes-Merton formula. Secondly, mean reversion seems to decrease as maturity lengthens, which suggests that a simple average of short-term implied volatility does not fully explain the one of longer-term implied volatilities. Instead, option markets seem to weigh nearer volatilities more than farther ones.

2.4.5 Market news

In this study, macroeconomic market news concerning major issues affecting international economy are been taken into account. Intuitively, negative news from the Euro zone and the US should have an effect both on the level of Euro implied volatility and on the skewness of implied volatility distribution.

Scheduled market news is selected instead of unscheduled ones, which by definition should be surprises to all market participants. Thus, analysing implied volatility changes around this news should not provide statistically significant results.

2.4.6 Monetary policy action

An official description of a monetary policy action by European Central Bank states *"an action undertaken by a central bank using the instruments at its disposal in order to achieve its objectives (e.g. maintaining price stability).* (www.ecb.int, a)" Price stability is stated to be the primary goal for the ECB, including a target inflation rate of two per cent throughout the EMU area.

The Federal Reserve, however, states the term monetary policy somewhat differently: policy actions are taken *"to influence the availability and cost of money and credit as a means of helping to promote national economic goals.* (www.federalreseve.gov, a)" Interestingly, ECB's and FED's outspoken monetary policy goals differ from one another. This being said, also the actions taken may differ.

Monetary policy actions and their effect on implied volatility have been studied, for instance, by Rogers & Siklos (2003). In their study, Bank of Canada (BoC) and Reserve Bank of Australia's (RBA) monetary policy actions were under attention.

A rather clear conclusion of monetary policy actions is that only an act with an unexpected timing or contents appears to actually have a significant effect. For example, an action of lowering a prevailing central bank interest rate is only visible in market participants' reactions if either the magnitude of the change or the direction of the change succeeds in surprising the markets.

Traders and other market participants pay attention to these short-term interest rates since they represent the paramount factor in currency valuation - traders look at most other indicators merely to predict how rates will change in the future.

The 6 members of the ECB Executive Board and the 16 governors of the Euro area central banks vote on where to set the rate. The split of votes is not publicly revealed.

2.4.7 Consumer price index

Consumer price index, hereafter CPI, indicates the average change over time in the prices paid by consumers for a market basket of consumer goods and services (Bureau of Labor Statistics, 1 http://www.bls.gov/cpi/home.htm). Besides of being an economic indicator for its own right, the CPI is also widely used in deflating other economic variables and adjusting nominal currency values, thereby allowing for price comparison over periods of time, taking inflation into account.

The CPI is calculated as follows:

$$\frac{CPI_2}{CPI_1} = \frac{Price_2}{Price_1}$$

(eq. 11)

Where 1 is the comparison year 2000 and CPI_1 is usually an index of 100.

For multiple items and CPI weighted index calculation,

$$CPI = \sum_{i=1}^{n} CPI_i * weight$$

(eq.12)

The CPI is the most widely used measure of inflation and is sometimes viewed as an indicator of the effectiveness of government economic policy. It provides information about price changes in the Nation's economy to government, business, labor, and private citizens and is used by them as a guide to making economic decisions. In addition, the CPI is employed to aid in formulating fiscal and monetary policies. (Bureau of Labor Statistics, 1) Sub-indices describing the costs of housing, food, to name a few, are being used in calculating the CPI.

The CPI and its components are used to adjust other economic series for price changes and to translate these series into inflation-free dollars.

The CPI is included in this study for two reasons. Firstly because of its relevance in earlier studies on implied volatility and market news described below and, secondly, its ability to capture inflation level and therefore to mirror an overall level of economic activity.

2.4.8 Unemployment rate

Another indicator describing the overall economic activity in a country is unemployment rate. Unemployment figures describe the overall economic state through a dual mechanism: on one hand, unemployment indicates the rate at which companies are operating via their need for labor. On the other hand, an adequate level of consumption in an economy is mainly dictated by private consumption, which, in turn, is largely dependent on unemployment level.

2.4.9 GDP growth

GDP growth, accounting for the overall amount of products and services produces within a nation and measured in monetary terms, is considered an important macroeconomic factor for several reasons. First of all, comparing the most recent figures with the ones of previous quarter or year, taking the inflation into account, provides information about the direction of a national economy.

From international investors' point of view, GDP growth figures are being used for asset allocation decisions: to find the largest growth opportunities worldwide. Rapidly growing national economies typically attract most new investments.

3. Delimitations of the study

A limitation in this type of study assessing markets' risk view stems from an assumption of investors' homogeneous risk profile. Intuitively, investment bankers have a much higher risk appetite than private individuals. In search of high returns subsequently turning into high bonuses, bankers can easily be assumed to accept more risk of losing their money, which in fact is not their money at all. For a private investor putting her own savings at a risk, seeking for high yield with a high risk level is much less likely. This idea is being further reinforced by Neely (2009).

As Vagnani (2009) concludes, much more attention should be put on issues of heterogeneity of traders' beliefs, learning, and institutionalized norms, and inspects their implications for the emergence of the volatility smile. He sees option pricing and implied volatility not merely as a mathematical problem but a problem more related to individuals with bounded rationality (ibid). When analyzing the results of this study, these remarks should be considered.

Option implied volatilities provide market information about the expected exchange rate return volatility for the period until the expiry date of the option. Unlike the realized volatilities, the implied volatilities are forward-looking. However, implied volatility may be a biased representation of market expectations if, for instance, volatility risk is priced or transaction prices do not represent equilibrium market prices or the option pricing model is mistakenly specified. Despite these concerns, implied volatilities have often been found to be a better volatility forecast in literature than those given by historical price models.

The selection of event window length is a crucial issue and therefore a source of uncertainty. Despite earlier studies' well justified methodology and this study's event window lengths being consistent with them,

uniqueness of each event and frequency of individual pieces of market news may affect the reliability of results.

Implied volatility can be considered a self-explanatory variable as far as its future prediction capability goes. Formed by option traders, who typically are also market participants in the spot market, it is clear that this shared view of future risk affects the “t+1” spot markets. This, in turn, exposes foreign exchange markets to speculative asset pricing. Closely related to previous literature, especially Bauwens et al (2005), well-informed and effective markets could show no alterations in implied volatility between pre-event and post-event periods with all changes taking place prior to a news announcement.

As far as data selection goes, high-frequency intraday data would suit better. Daily data are, however, the most frequent available. Furthermore, the amount of random noise and high possibilities of market overreaction included in hourly data dilute their value.

4. Research methodology

In the event study approach, Mann-Whitney-Wilcoxon (MWW) U-test for similarity of two independent samples is being employed. A five-day event window on both sides of the event itself is used to assess these events' permanency.

MWW test is a nonparametric test for assessing whether or not two distributions are similar. In other words, this type of testing is primarily interested in differences between two samples of data, namely their mean values.

For small sample sizes, test statistic is calculated as follows:

$$U_1 = R_1 - \frac{n_1(n_1 + 1)}{2}$$

(eq. 14)

where

n_1 = the sample size for sample 1

R_1 = the sum of the ranks in sample 1.

Similarly,

$$U_2 = R_2 - \frac{n_2(n_2 + 1)}{2}$$

(eq. 15)

Sample data period ranges from January 2005 until the end of 2009. Each event taking place between these dates has been dated and five-day pre-event and post-event periods constructed around the event. MWW methodology is then being used in order to assess whether or not a certain type of an announcement actually has got any significance from investors' point of view.

Following Morel & Teiletche's (ibid.) study methodology, event window is being surrounded by pre- and post-event periods. Furthermore, the explicit period of event research has been limited to ten days, five preceding and five subsequent days. This is to make sure that, on one hand, the event period is not too long and thus only one event at a time has been studied. On the other hand, a too short event window might not be able to capture the entire effect of an event.

Differing from Morel & Teiletche's (ibid.) approach, the events of this study consist of both actual central bank interventions and other macroeconomic news factors. The reasoning behind this approach is that not only actions taken but also the ones not committed are regarded as a signal to market participants. These actions not taken, i.e. a decision not to alter prevailing interest rate, are then visualized only in market news, not in central bank interventions, but are nonetheless important signals for markets.

Daily data of Euro implied volatility against US dollar has been exploited. Despite including some random noise, daily observations are the best way to analyse sudden alterations taking place, actually, on an hourly basis. This methodology captures the nature of such events in a more accurate way than a research based on regression analysis.

Statistical null hypothesis have been introduced above in equations 2 and 3.

5. Testing Euro implied volatility

Testing Euro implied volatility around major macroeconomic news announcements follows a procedure consisting of three steps in this study. Firstly, the most important news factors have been selected. Second of all, implied volatility levels around these events have been paid attention to: five daily observations preceding the actual event date are selected to construct a pre-event period.

Thirdly, the actual event date itself and four subsequent observations are used to build a post-event period. Fourth of all, the pre- and post-event periods are being labelled as 'a' and 'b' periods, so that, for example, the first unemployment announcement observation '1' is being further divided into '1a' and '1b', indicating the periods before and after the event, respectively.

Fifthly, employing statistical software (SPSS), the Mann-Whitney-Wilcoxon test has been applied to assess whether periods '1a' and '1b', for example, differ from one another. The confidence level used is 95 per cent.

The sixth step only includes test results of statistical significance at 95 per cent confidence level. In this grade, employing graphical demonstration, implied volatility level around an event date has been analysed. Furthermore, as previous literature (see e.g. Nikkinen, 2006) suggests the implied volatility level to drop below its long-time average, an average figure of implied volatility is also included in graphs. However, this average only covers rolling figures of previous three months. This decision has been made because of highly heterogeneous levels of implied volatility compared on a year-to-year basis (see Table XX below); for instance, the Euro implied volatility for the year 2006 averaged 7 per cent, compared to slightly over 14 per cent in 2009.

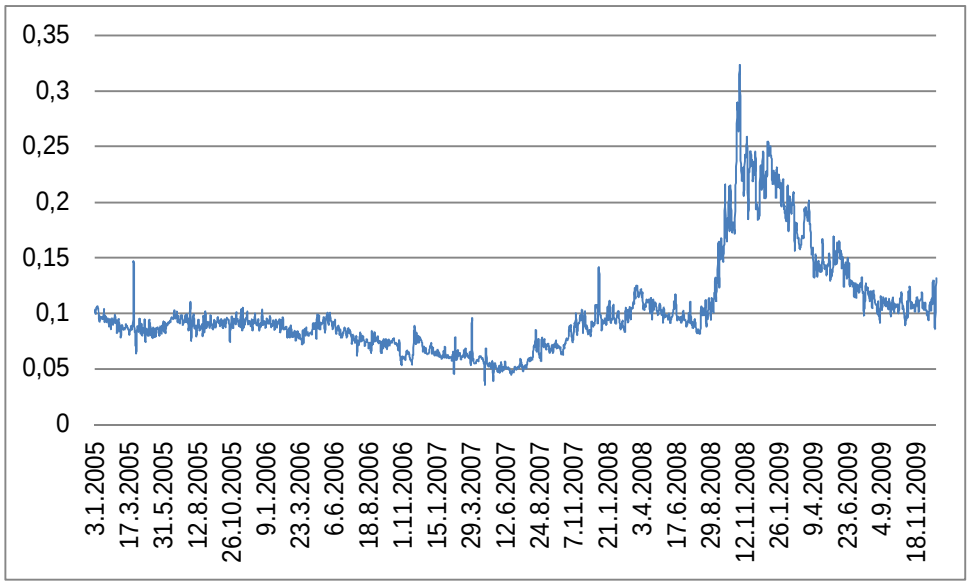
After running this test procedure, a conclusion based on test results is being constructed.

5.1 Data description

	2005	2006	2007	2008	2009	2002-2009	2005-2009
Mean	0,0907	0,0796	0,0662	0,1336	0,1410	0,1026	0,1023
Standard Error	0,0005	0,0006	0,0009	0,0034	0,0024	0,0008	0,0012
Median	0,0908	0,0798	0,0623	0,1062	0,1294	0,0968	0,0916
Mode	0,0843	0,0825	0,0551	0,1250	0,1326	0,0943	0,0959
Standard Deviation	0,0073	0,0101	0,0150	0,0547	0,0390	0,0351	0,0432
Sample Variance	0,0001	0,0001	0,0002	0,0030	0,0015	0,0012	0,0019
Kurtosis	13,5850	-0,3951	2,1755	0,3003	-0,0288	5,9438	3,2592
Skewness	1,6098	-0,2552	1,2103	1,2468	0,9573	2,0702	1,7840
Range	0,0828	0,0475	0,1053	0,2396	0,1684	0,2853	0,2853
Minimum	0,0644	0,0533	0,0359	0,0816	0,0860	0,0359	0,0359
Maximum	0,1471	0,1008	0,1412	0,3212	0,2544	0,3212	0,3212

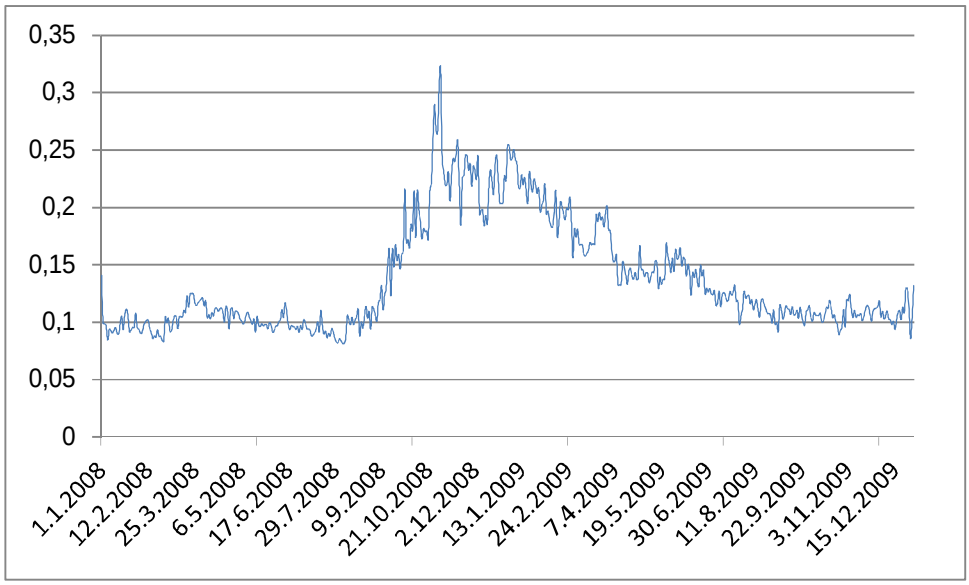
Table 1. Descriptive statistics

Table 1 clarifies the descriptive figures for Euro implied volatility throughout the time span of the study. In 2008 and 2009, both mean and median implied volatility figures are considerably higher than either on the entire Euro existence or the study time span from 2005 to 2009. In fact, 2007 seems to have been a year of extraordinarily low implied volatility figures, indicating strong trust and low risk level attributed to Euro.



Graph 3. USD-nominated Euro implied volatility 2005-2009

Graph 1 illustrates the Euro implied volatility level calculated from USD-nominated - that is, the US dollar being the base currency - call options throughout the existence of the single currency. Towards the end of the period, IV rises dramatically, reaching its all-time-high of 32 per cent on 31st October, 2008, strongly outperforming the average of 10,26 and the median of 9,68 per cent. This peak was reached only a couple of days after both European Central Bank and Fed announced massive support packages to boost the national economies.



Graph 4. USD-nominated Euro implied volatility 2008-2009

In Graph 4, the implied volatility peak shows more clearly. Interestingly, towards the spring 2009, implied volatility lowered again, close to the average levels that have persisted throughout the studied time frame.

5.2 Inflation, CPI & implied volatility

As an accurate measure of an economy's overall activity level, inflation level in both the Euro area and the US is being paid attention to. In an environment of decreasing economic growth, inflation levels are expected to plunge. At the same time, unemployment rate tends to move upwards.

5.2.1 Euro area inflation

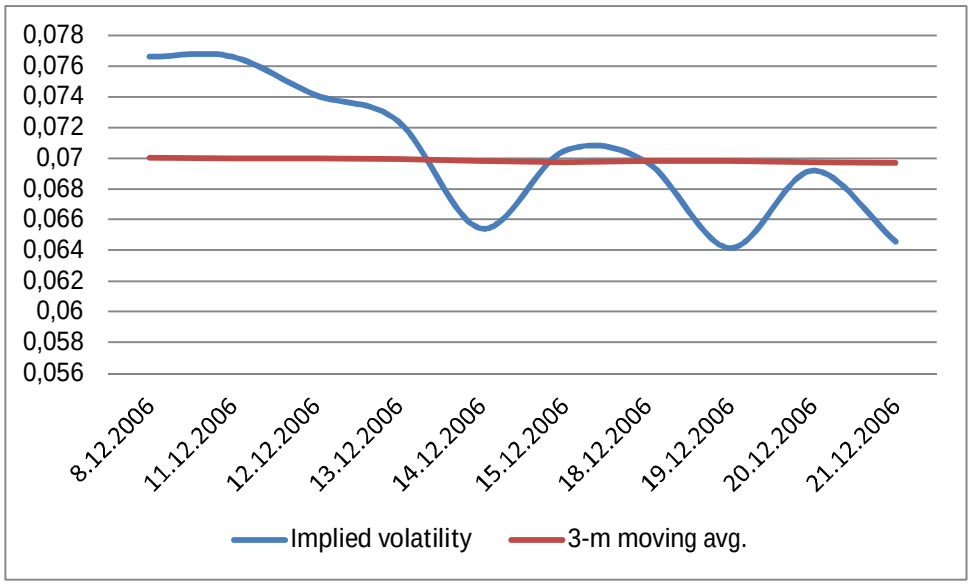
Out of monthly Euro area inflation figures announced from 2005 until the end of 2009, 11 out of 46 observations proved to have a statistical value. The results are summarized in Table 2 and introduced in more detail in Appendix 1.

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,674a	-1,483a	-,405b	-,135a	-1,753b	-1,490b	-1,214a
Asymp. Sig. (2-tailed)	0,5	0,138	0,686	0,893	0,08	0,136	0,225
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753a	-1,483a	-,135a	-2,023a	-2,023a	-2,023a	-2,032a
Asymp. Sig. (2-tailed)	0,08	0,138	0,893	0,043	0,043	0,043	0,042
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,674b	-,405b	-2,023b	-,674a	-,944b	-,674a	-,944b
Asymp. Sig. (2-tailed)	0,5	0,686	0,043	0,5	0,345	0,5	0,345
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-2,023b	-1,214b	-,405a	-1,753b	-2,023b	-,405b	-1,753a
Asymp. Sig. (2-tailed)	0,043	0,225	0,686	0,08	0,043	0,686	0,08
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-1,214a	-,135b	-,135b	-2,023b	-1,753a	-,135a	-1,753b
Asymp. Sig. (2-tailed)	0,225	0,893	0,893	0,043	0,08	0,893	0,08
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-1,214a	-2,023b	-,674b	-2,023a	-1,214a	-,405b	-,135b
Asymp. Sig. (2-tailed)	0,225	0,043	0,5	0,043	0,225	0,686	0,893
	43b - 43a	44b - 44a	45b - 45a	46b - 46a			
Z	-2,023a	-,944b	-,674b	-1,753b			
Asymp. Sig. (2-tailed)	0,043	0,345	0,5	0,08			

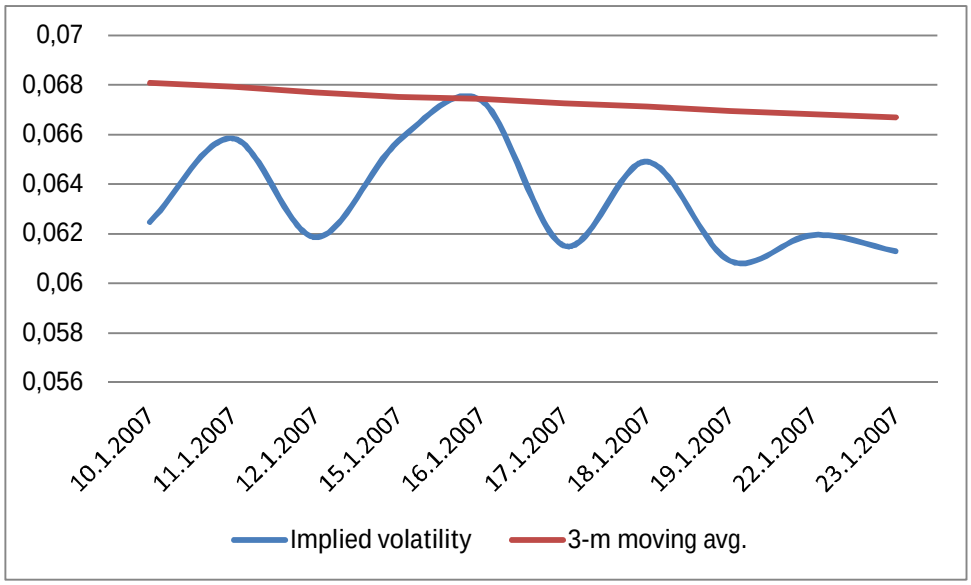
a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Table 2. Results summary for Euro area inflation



Graph 5.Euro area inflation announcement 15th December, 2006

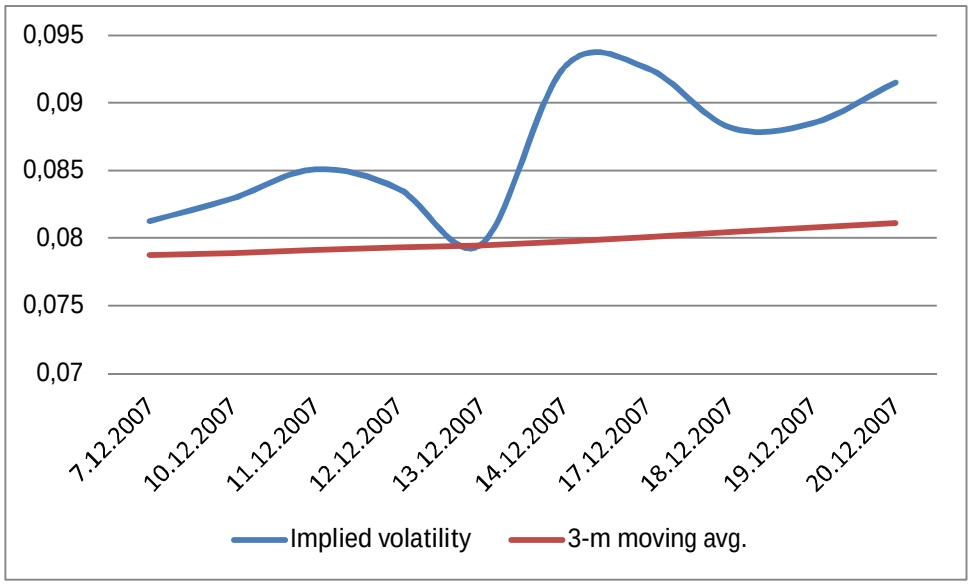
In Graph 5, announcement of Euro area inflation level rising to 1,9 per cent resulted in an implied volatility change widely backed up by existing literature. A steep rise in implied volatility level prior to the announcement was followed by a steep drop afterwards, bringing the uncertainty measure well below its three-month moving average levels. The inflation figure itself, up from 1,6 per cent from the month before and thus accounting for a decrease of 0,3 per cent units, indicated little change in Euro area economic activity.



Graph 6. Euro area inflation announcement 7th January, 2007

Graph 6 illustrates changes in implied volatility levels around 17th January, 2007. No alterations in the inflation level were announced, yet an ease in uncertainty about the news content resulted in a lower level of implied volatility from its regional high on the 16th January.

A detail worth mentioning, four inflation announcements in a row from October, 2006 to January, 2007 all turned out to have a statistically significant effect on implied volatility levels. However, the two of December's and January's appeared to be the only ones backed up by previous studies on the topic, others showing no visible pattern around the announcements.



Graph 7. Euro area inflation announcement 17th December, 2007

The pattern around an announcement on 14th December, 2007 is illustrated in Graph 7. A rather steep rise in inflation, to 3,1 per cent from 2,6 the month before, also resulted in a peak in implied volatility levels. Once announced, this piece of news results in a lower level of implied volatility. However, uncertainty remained high and above the three-month average levels despite the news.

To summarize, Euro inflation turned out to be a significant factor as far as implied volatility patterns go, by more than one-fourth of the observations being statistically significant. However, no clear pattern of market perceptions can be drawn from these findings. Earlier literature receives some backup, but, on the contrary, market participants appear to react to some inflation news in a totally opposite manner.

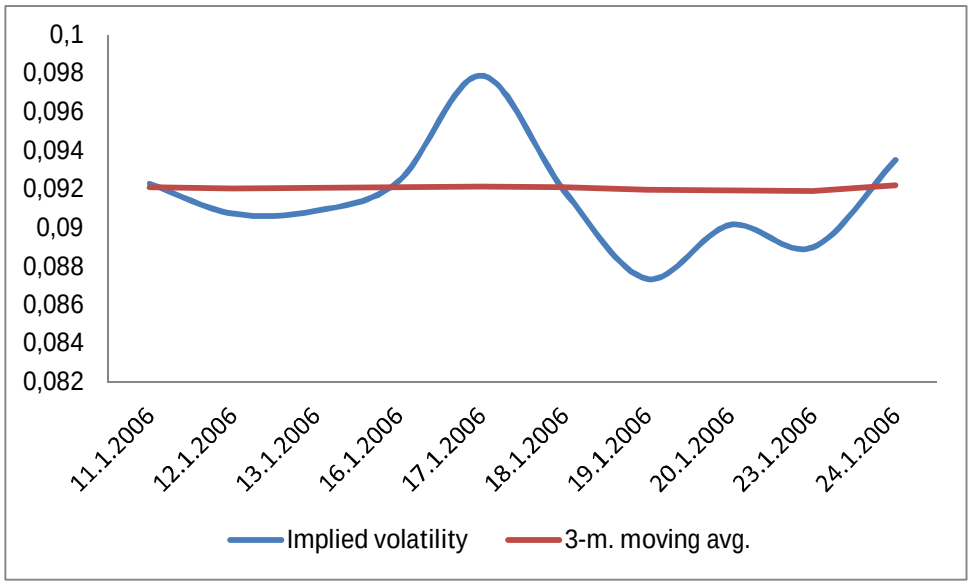
5.2.2 US inflation and implied volatility

In the case of US inflation, two observations contained statistical significance. See Appendix 2 for further details.

Test Statistics(c)							
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,405a	-2,023b	-1,483b	-,135b	-2,023a	-1,490a	-1,214b
Asymp. Sig. (2-tailed)	0,686	0,043	0,138	0,893	0,043	0,136	0,225
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753b	-1,214b	-,135b	-1,753b	-2,023b	-2,023b	-2,023b
Asymp. Sig. (2-tailed)	0,08	0,225	0,893	0,08	0,043	0,043	0,043
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,405a	-,944a	-1,753a	-,135a	-1,483b	-1,214b	-,944a
Asymp. Sig. (2-tailed)	0,686	0,345	0,08	0,893	0,138	0,225	0,345
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,674a	-2,023a	-,944a	-2,023a	-1,214a	-1,483b	-2,023a
Asymp. Sig. (2-tailed)	0,5	0,043	0,345	0,043	0,225	0,138	0,043
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-,405a	-,944b	-,135a	-,135a	-,135a	-2,023a	-,405b
Asymp. Sig. (2-tailed)	0,686	0,345	0,893	0,893	0,893	0,043	0,686
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-,944b	-1,214b	-2,023a	-,405a	-2,023b	-,135b	-,405a
Asymp. Sig. (2-tailed)	0,345	0,225	0,043	0,686	0,043	0,893	0,686
	43b - 43a	44b - 44a	45b - 45a	46b - 46a	47b - 47a		
Z	-,135a	-2,023b	-,944a	-1,753a	-1,753a		
Asymp. Sig. (2-tailed)	0,893	0,043	0,345	0,08	0,08		

a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

Table 3. Results summary for US inflation



Graph 8. US inflation announcement 18th January, 2006

US inflation decreased from the level of the previous month in January, 2006. Market unease started increasing a week prior to the announcement on the 18th January. A noteworthy fact is that the actual peak was perceived on the 17th. Still, these findings are in line with the previous literature as the peak takes place on the pre-event period, the implied volatility levels lowering below their three-month moving average on the post-event period.

To summarise this section, inflation figures clearly have an effect on Euro implied volatility. However, the effect appears to have more strength in the case of Euro inflation, implying that “domestic” news is superior in significance. Neither seems to provide a clear pattern, as market reactions to inflation announcements vary.

5.3 Unemployment and implied volatility

5.3.1 US unemployment

When assessing implied volatility changes around US unemployment figure announcements, a total of forty-nine monthly observations from 2005 to 2009, and the event window length was set to range from five preceding to five consecutive observations around the actual announcement.

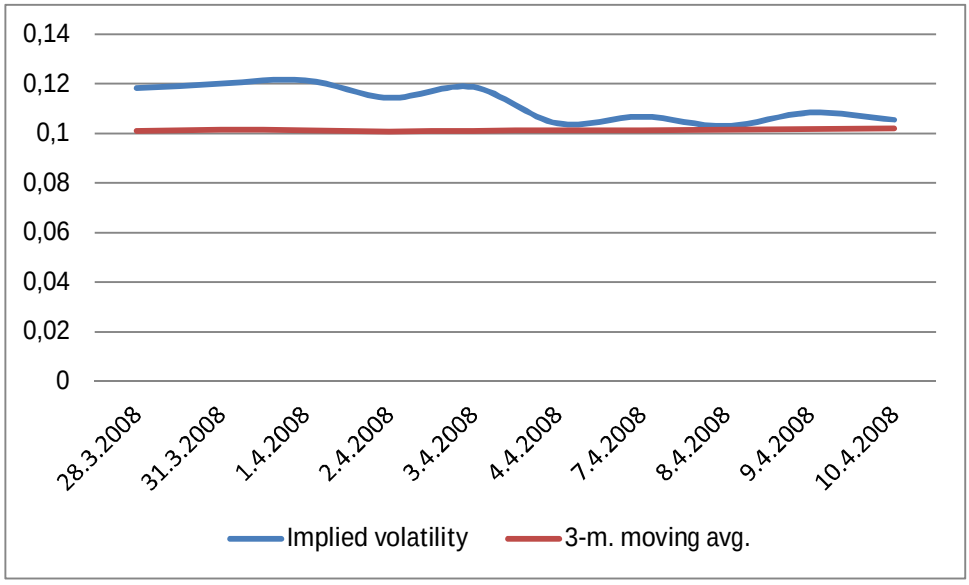
Test Statistics(c)							
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,944a	-,944a	-,405b	-,135b	-1,753a	-1,214a	-1,214a
Asymp. Sig. (2-tailed)	0,345	0,345	0,686	0,893	0,08	0,225	0,225
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,135a	-,405a	-,944a	-1,214b	-1,483b	-1,214a	-2,023a
Asymp. Sig. (2-tailed)	0,893	0,686	0,345	0,225	0,138	0,225	0,043
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-1,753a	-,405b	-,674a	-,674a	-,405b	-1,483b	-,674b
Asymp. Sig. (2-tailed)	0,08	0,686	0,5	0,5	0,686	0,138	0,5
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,944a	-1,753a	-,944a	-2,023a	-1,753a	-1,214a	-1,753b
Asymp. Sig. (2-tailed)	0,345	0,08	0,345	0,043	0,08	0,225	0,08
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-2,023a	-2,023a	-1,483b	-1,214a	-1,483a	-2,023b	-,944b
Asymp. Sig. (2-tailed)	0,043	0,043	0,138	0,225	0,138	0,043	0,345
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-,674a	-2,023a	-2,023a	-,944a	-1,483a	-2,023a	-1,214b
Asymp. Sig. (2-tailed)	0,5	0,043	0,043	0,345	0,138	0,043	0,225
	43b - 43a	44b - 44a	45b - 45a	46b - 46a	47b - 47a	48b - 48a	49b - 49a
Z	-1,483a	-2,023a	-2,023a	-1,483b	-,405a	-1,483a	-2,023a
Asymp. Sig. (2-tailed)	0,138	0,043	0,043	0,138	0,686	0,138	0,043

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Table 4. Results summary for US unemployment

The actual event date is included in the post-event period. Since all data represent closing values for each trading day, the event is assumed to take place prior to the option price, and therefore the actual implied volatility observation as well.

Results indicate some significant alterations in Euro implied volatility level around the announcement dates. To be precise, out of 49 events, in ten cases a significant change occurred. These cases are discussed in detail below.



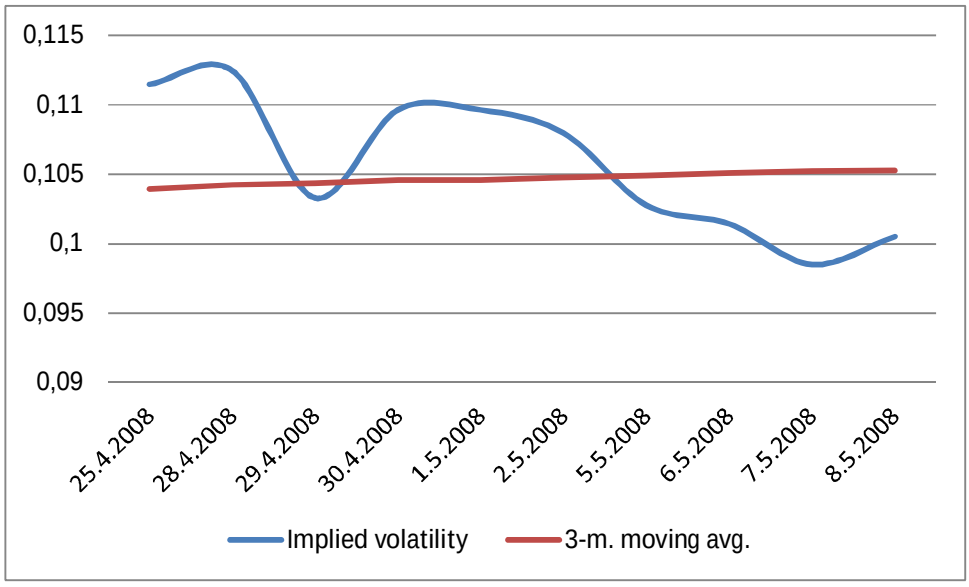
Graph 11. US unemployment announcement 4th April, 2008

Graph 11 mirrors the implied volatility level around the unemployment figures announced on 4th April, 2008. The announcement itself included a significant 0,3 per cent units rise in unemployment figures, from 4,8 to 5,1 per cent. This figure was slightly worse than expected (forecast 5,0 per cent). However, worse-than-expected figure was not enough to further increase implied volatility levels, whereas eased uncertainty shows in considerably lower volatility expectations level. Though remaining at a

higher level than a moving three-month average and thus implying significant unease within market participants, unwrapping the piece of news resulted in a statistically significant reduction as far as future uncertainty goes.

Again, implied volatility reaches its regional high prior to the event itself, backing up the original hypothesis (see eq. 1). A considerably lower level of implied volatility is perceived on the post-event period, lowering down near the three-month moving average levels.

Daily closing values for option prices and implied volatility figures being used, the actual event date is located in the post-event period.

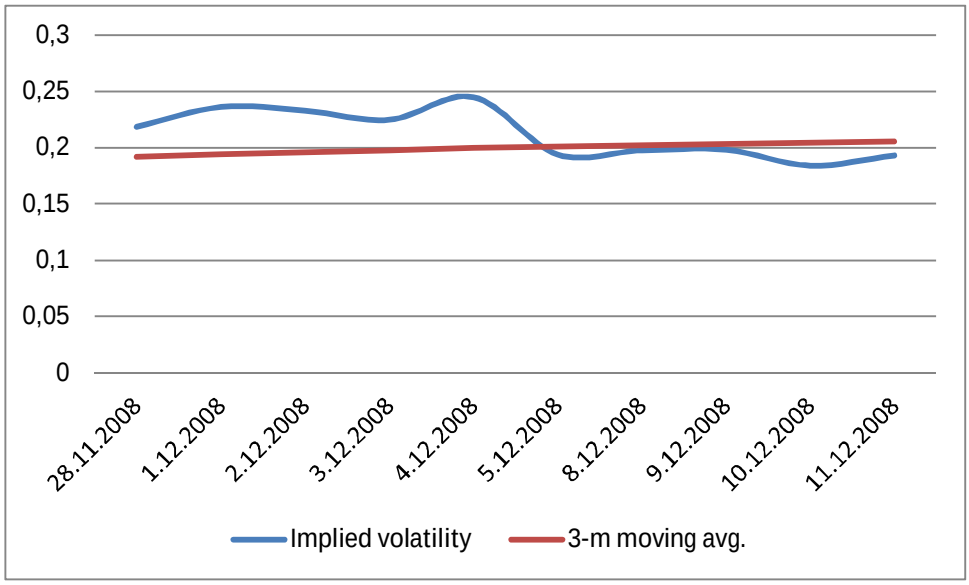


Graph 12. US unemployment announcement 2nd May, 2008

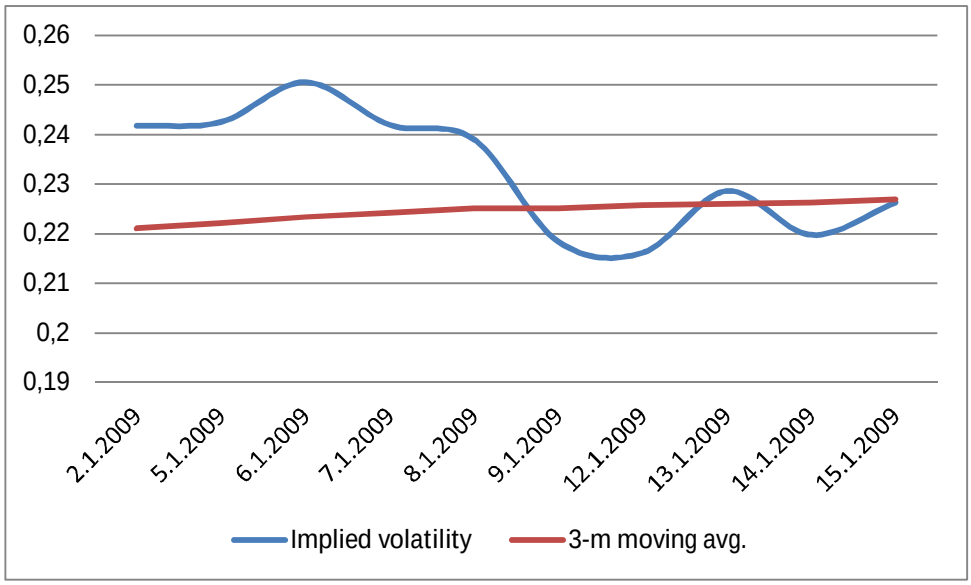
In Graph 12, a slightly downward-sloping US unemployment level is again mirrored in implied volatility levels by a regional high prior to the announcement date and a considerable drop afterwards.

Similar to the cases above, the implied volatility actually reaches its peak a day before the announcement date, staying at a high level for a while – until the actual unemployment figure announcement relieves the unease.

In this case, however, the actual announced unemployment figure was slightly lower than expected, 5,0 per cent versus the forecast 5,2. Compared to the case of 4th April, 2008, graphically illustrated in Graph 11, pieces of news with effectively opposite contents have a quite similar effect on implied volatility. If this kind of market behavior is found more frequently, one could easily join the concert of previous literature by concluding that no matter what the contents are, the unwrapping of the package itself is what counts.

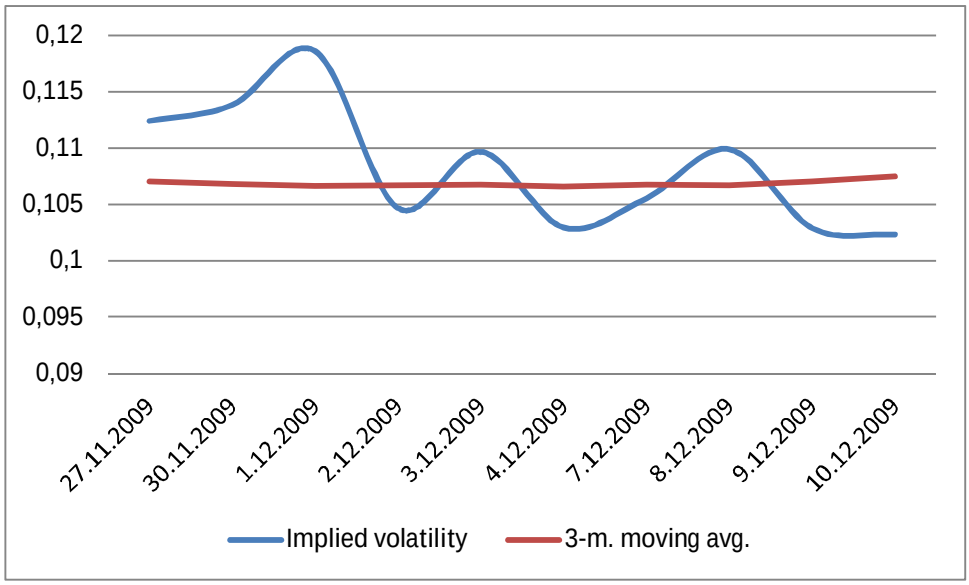


Graph 14. US unemployment announcement 5th December, 2008



Graph 15. US unemployment announcement 9th January, 2009

The indication provided by Graphs 14 and 15 sets further backup for existing literature's view on implied volatility behaviour. Both the statistical significance and the direction of the change taking place are exactly as intuitively expected and previously examined in earlier studies.



Graph 16. US unemployment announcement 4th December, 2009

As illustrated in Graph 16, on 4th December, 2009, as US unemployment level was announced to decline from the one of a month before to 10 per cent, implied volatility level significantly lowered on the post-even period compared to the pre-event period. Still, no clear direction for the implied volatility level can be observed as another peak occurs on the 8th December.

When assessing the direction of US unemployment change and its effect on implied currency volatility, no clear pattern of whether upward-sloping unemployment curve would increase the implied volatility levels, or vice versa, was detected. Results were mixed in that sense as well. For detailed test score statistics, see Appendix 3.

For European unemployment announcements, the results are similar to the ones above. Again, event dates appear to include some value when assessing changes in implied volatility levels, but their effects are not statistically significant, and, as such, should be neglected.

Lowering the confidence level from 99 to 95 per cent would include nearly half of the observations (22/48) into statistical significant ones in the case of both EU unemployment and US unemployment announcements.

5.3.2 Euro area unemployment

Of European monthly unemployment figures, eight cases out of forty-six showed statistically significant inequalities when it comes to levels of implied volatility on pre-event and post-event periods. Appendix 4 provides further information on the results.

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,944a	-,674b	-,135b	-,944b	-,135b	-1,483a	-,944a
Asymp. Sig. (2-tailed)	0,345	0,5	0,893	0,345	0,893	0,138	0,345
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753b	-,944a	-,135b	-1,483b	-1,753a	-2,023a	-,405b
Asymp. Sig. (2-tailed)	0,08	0,345	0,893	0,138	0,08	0,043	0,686
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,674b	-1,483a	-,135b	-,405b	-1,753b	-2,023b	-,944b
Asymp. Sig. (2-tailed)	0,5	0,138	0,893	0,686	0,08	0,043	0,345
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,135a	-,674a	-1,753a	-2,023a	-1,753b	-,674a	-,674a
Asymp. Sig. (2-tailed)	0,893	0,5	0,08	0,043	0,08	0,5	0,5
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-,405a	-1,214b	-,135b	-,674b	-,944a	-1,753a	-2,023a
Asymp. Sig. (2-tailed)	0,686	0,225	0,893	0,5	0,345	0,08	0,043
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-1,214a	-2,023a	-2,023a	-,674b	-1,214b	-2,023a	-2,023b
Asymp. Sig. (2-tailed)	0,225	0,043	0,043	0,5	0,225	0,043	0,043
	43b - 43a	44b - 44a	45b - 45a	46b - 46a			
Z	-,674b	-,674a	-1,483b	-,674a			
Asymp. Sig. (2-tailed)	0,5	0,5	0,138	0,5			

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Table 5. Results summary for Euro area unemployment

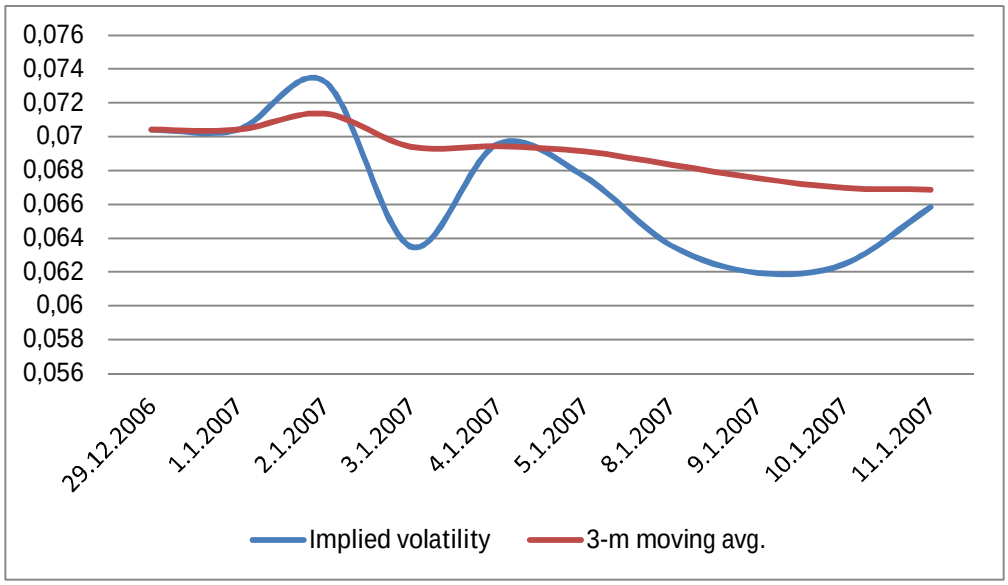
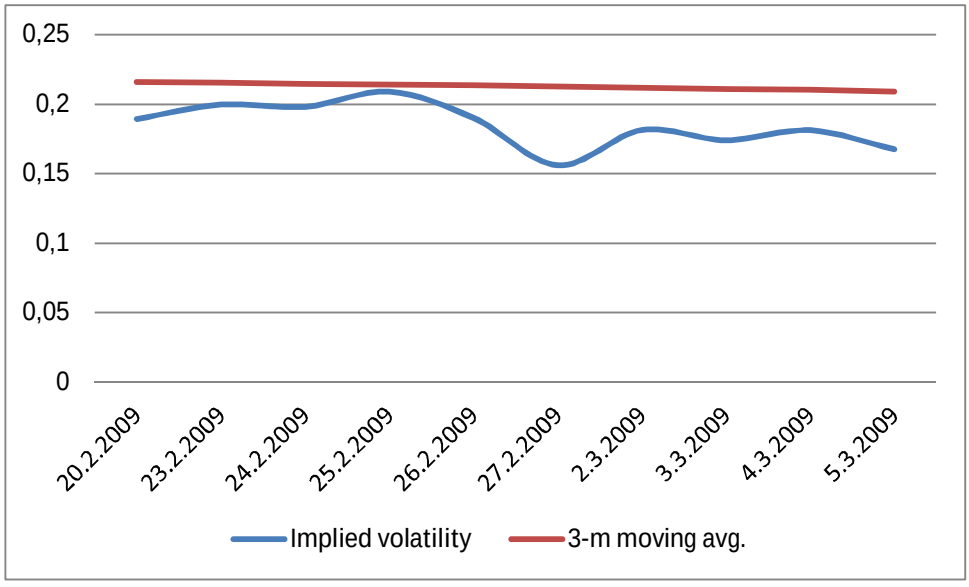


Figure 6 Graph 17. Euro area unemployment announcement 5th January, 2007

Graph 17 provides an another example of implied volatility reaching its regional peak on the day of event, afterwards lowering below three-month average figures once the official level of unemployment figures, lowering to 7,6 per cent from the month before, was revealed.



Graph 18. Euro area unemployment announcement 27th February, 2009

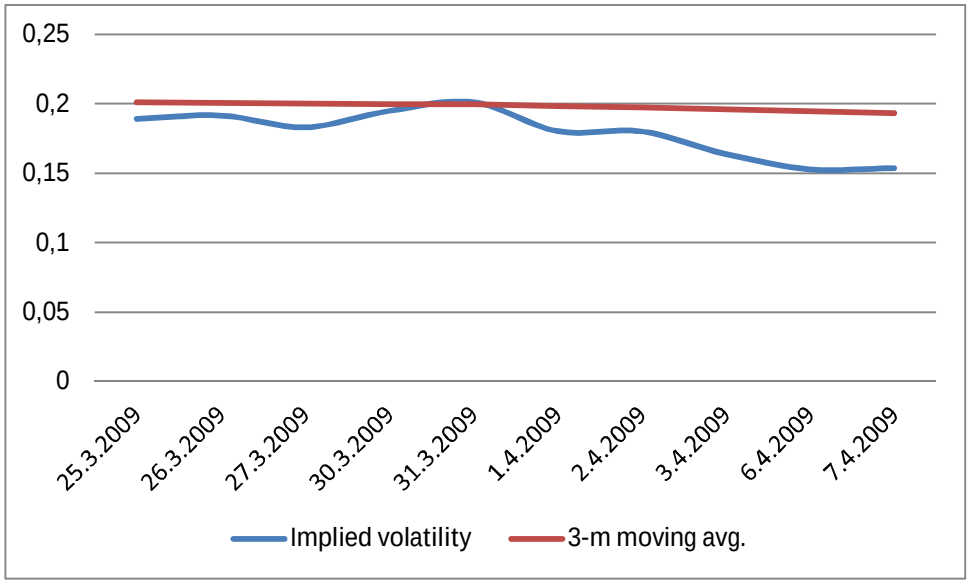


Figure 7 Graph 19. Euro area unemployment announcement 1st April, 2009

Both Graph 18 and Graph 19 suggest, again, the implied volatility level to reach a regional peak prior to the announcement. This level of implied volatility around the event, compared to its three-month moving average, supports the existing literature's conclusion.

5.3.3 Unemployment figures – a conclusion

Clearly, as one-fifth – ten out of forty-nine perceptions – share of US unemployment figure announcements show statistical significance as far as implied volatility level alterations are concerned, the figure seems relatively low. Euro unemployment figures seem to include some importance as well, eight cases of weekly perceptions being significant.

Most of the significant results appear to provide further backup for previous academic literature (see e.g. Nikkinen et al, 2004). To draw a conclusion, unemployment figures imply to include a significant amount of

information according to which derivatives markets assess currency future volatility.

Another rather clear-cut implication of these results is a notion that few significant changes in implied volatility structure around market news announcements took place prior to 2008. Therefore, a vast difference between the so-called pre-Lehman and post-Lehman periods exists.

In other words, the world of finance appears to have changed somewhat dramatically through the credit crunch and financial crisis. A possible explanation arises from a drastic change in investor sentiment patterns, after realizing the true colours of the prevailing financial systems once so relied upon. During the economic boom, most macro news was merely shunned by the same investment bankers now being more alert and reacting correspondingly.

However, as mentioned above, many of these statistically significant results probably lack practical importance. The amount of a change in implied volatility levels is so moderate it would not likely affect option prices. In that sense, these study results are not applicable for trading strategies but, on the other hand, they provide information about investor behaviour and about the collective opinion of Euro risk levels.

5.4 Interest rate announcements & implied volatility

This section covers both ECB and FED's interest rate adjustment decisions and their effects on Euro implied volatility. The last subsection summarizes the findings.

5.4.1 FED interest rate

When assessing interest rate change effect on implied volatility, an important issue to be borne in mind is the so-called dual effect interest levels have on option pricing.

Firstly, interest rate as such is a significant variable (see Equation 1, or the basic model of BSM) for option valuation. For call options, the higher the interest rate, the lower the price.

Secondly, interest rate decisions not only affect option pricing directly but also through an impact of unease delivered to market participants through an altered view concerning asset future volatility. In other words, a direct effect setting an option price either lower or higher is not the only source of change and could even be offset by higher implied volatility.

For US interest level, the FED official rate, ten cases' significance concerning Euro implied volatility alterations were examined. Table 8 below and Appendix 5 summarize the results.

Test Statistics(c)

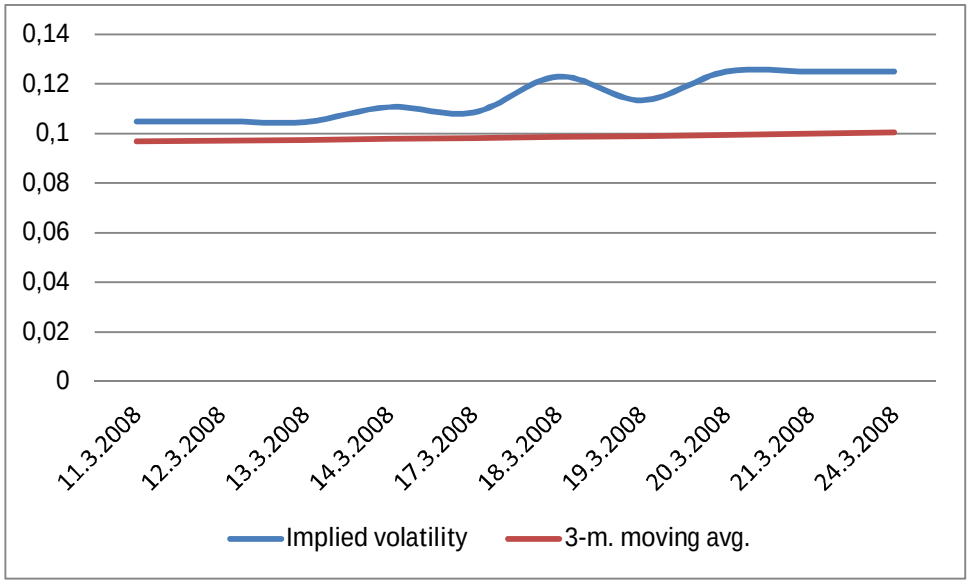
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,674a	-,674b	-,405a	-,944a	-,405b	-2,023a	-,405a
Asymp. Sig. (2-tailed)	0,5	0,5	0,686	0,345	0,686	0,043	0,686

	8b - 8a	9b - 9a	10b - 10a
Z	-1,214a	-2,023a	-1,483b
Asymp. Sig. (2-tailed)	0,225	0,043	0,138

a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

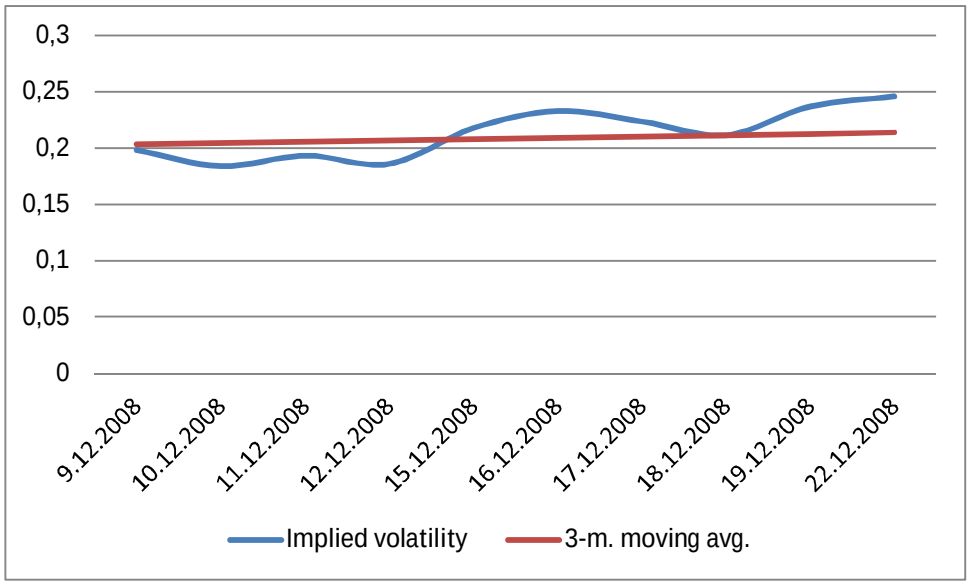
Table 8. Results summary for US (Fed) interest rate

Closer examination of the two highly significant at 95 per cent confidence level taking place 18th March and 16th December, 2008, is being included in Graph 20 and Graph 21.



Graph 20. FED interest rate announcement 18th March, 2008

In Graph 20, the implied volatility level reaches its regional high on the day of Fed announcement. The contents of the news included an interest rate cut by less than expected by markets, the event being the fifth consecutive cut. But as illustrated in the graph, the implied volatility level increases again a couple of days after the event. One should bear in mind that the Mann-Whitney-Wilcoxon test only assesses whether the two periods are different or not. In the case of this study, merely the similarity of pre-event and post-event periods is under attention. Still, reporting only the results backing up literature's assumptions would be inaccurate and biased.



Graph 21. FED interest rate announcement 15th December, 2008

Graph 21 illustrates implied volatility around a second consecutive interest rate cut on 16th December, 2008. The interpretation of the graph is similar to the one of Graph 20: the implied volatility reaches its peak, or regional high, on the day of the announcement, and drops afterwards.

To conclude, Fed interest rate policy announcements shows mixed results as far as Euro implied volatility is concerned. The changes significant and traceable with statistical procedures seem to back up existing literature's view of implied volatility's tendency to reach its regional high in times of uncertainty around a scheduled announcement with unknown content. The restrictions mentioned above are, however, to be taken into account.

In total, Fed announced seven interest rates cuts from summer 2007 until the end of 2009. Of these seven, two had statistical significance. Interestingly, all the other Fed interest rate announcements were highly insignificant, *p* values ranging from 0,138 to 0,686.

5.4.2 The ECB interest rate and implied volatility

The European Central Bank (ECB) interest rate announcements also have significance as far as Euro implied volatility level changes go. Cases significant at 95 per cent risk level lost some of their significance but the ones highly insignificant experienced no change in their level of statistical significance. Appendix 6 sums up the results in detail.

Analysis of significant changes is being illustrated in Graphs 22-25. Five out of twenty cases included a statistically significant move in implied volatility levels.

Test Statistics(c)

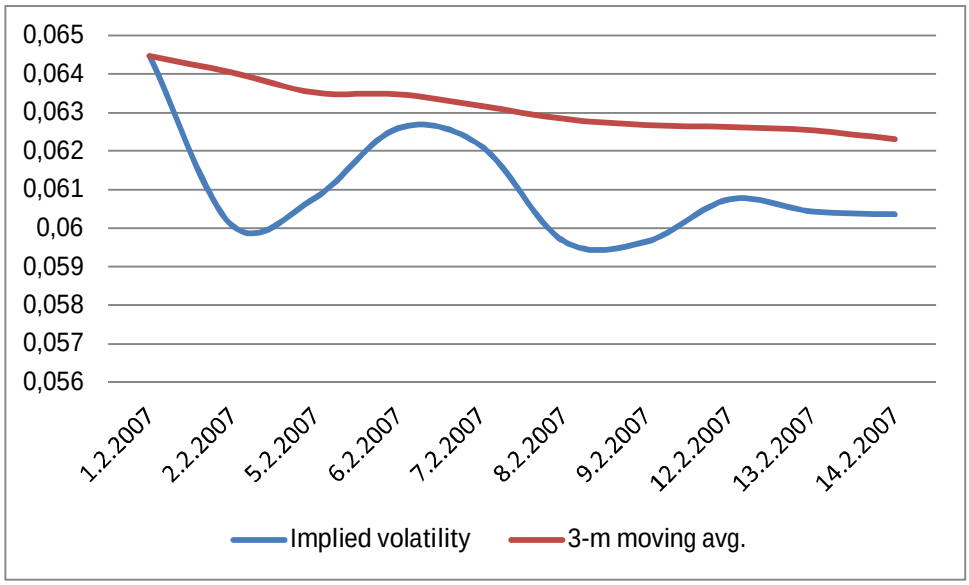
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-2,023a	-,674a	-,405b	-1,483b	-1,214a	-1,214a	-2,023a
Asymp. Sig. (2-tailed)	0,043	0,5	0,686	0,138	0,225	0,225	0,043

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,674a	-,944b	-2,023b	-1,214b	-1,214a	-2,023b	-1,214b
Asymp. Sig. (2-tailed)	0,5	0,345	0,043	0,225	0,225	0,043	0,225

	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a
Z	-1,483a	-1,753a	-1,214a	-1,214a	-1,753a	-2,023a
Asymp. Sig. (2-tailed)	0,138	0,08	0,225	0,225	0,08	0,043

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

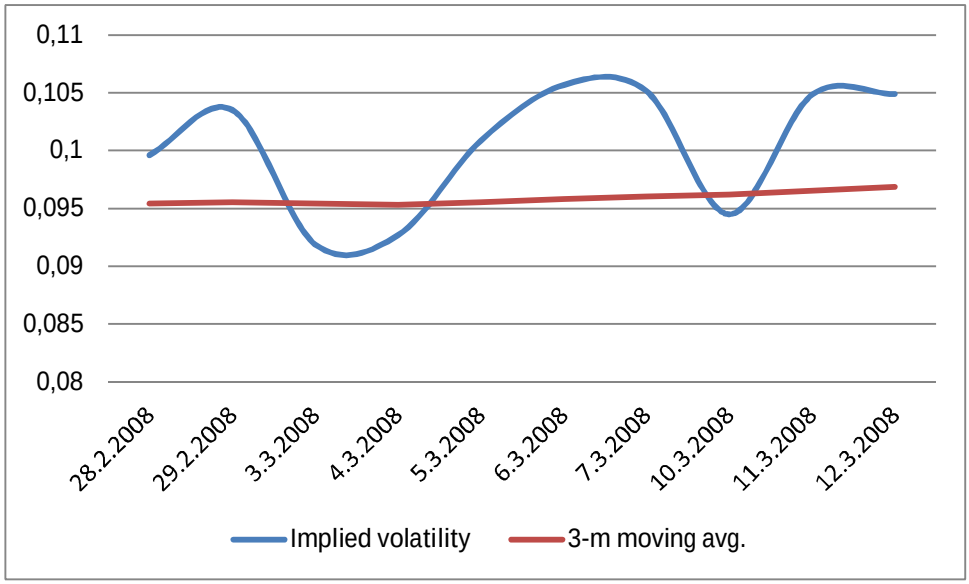
Table 9. Results summary for Euro (ECB) interest rate



Graph 22. ECB interest rate announcement 8th February, 2007

In Graph 22, illustrating the Euro implied volatility change around ECB interest rate decision on 8th February, 2007. The content of the decision included not to alter prevailing interest rate. The implied volatility reached its regional peak just two days prior to the event, indicating that preliminary figures announced by analysts may have affected markets' view.

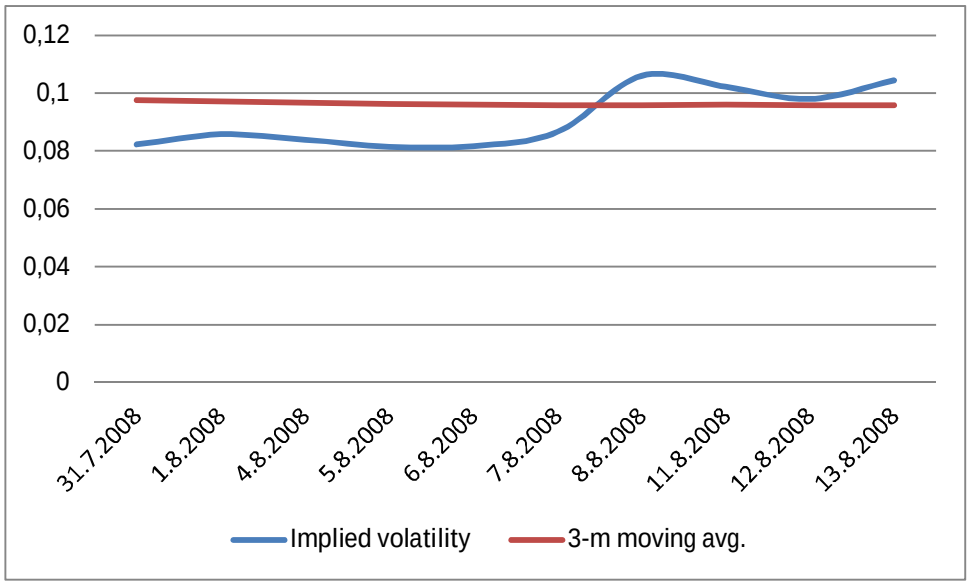
Furthermore, during the times of low Euro implied volatility – and low volatility in the global economy in general – this piece of news seemed to match the financial markets' expectations.



Graph 23. ECB interest rate announcement 6th March, 2008

In Graph 23, implied volatility peaks on 6th March, 2008, the day on which the European Central Bank decided not to alter the prevailing interest rate. This time, however, in the environment of accelerating inflation (3,1 per cent and rising), markets appear to be more insecure.

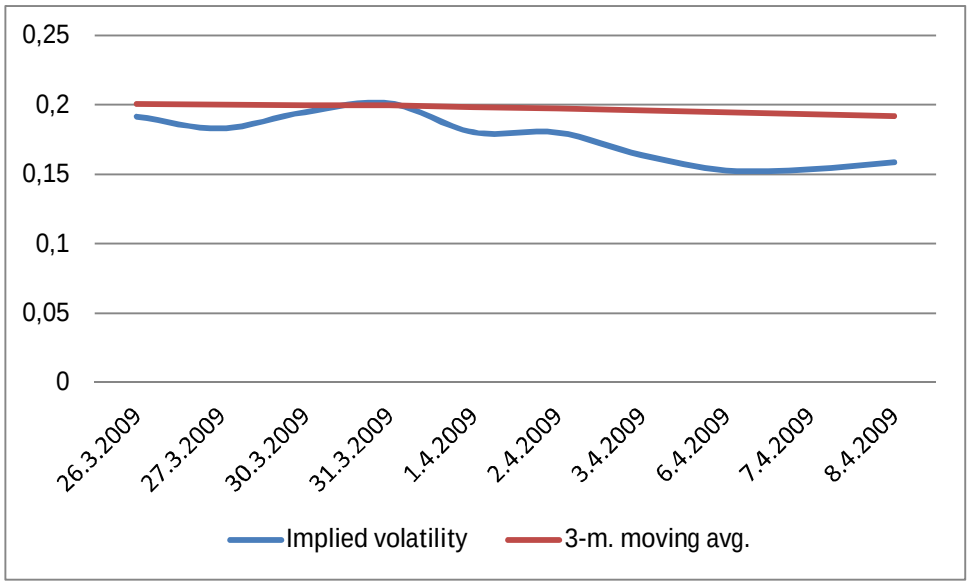
A steep rise in a risk level prior to the announcement, followed by a sharp fall afterwards, indicate the existence of a phenomena similar to existing literature, the uncertainty about the news contents strongly affecting risk level on the markets, whether the risk is measured by stock market volatility or currency option implied volatility.



Graph 24. ECB interest rate announcement 7th August, 2008

However, Graph 24 illustrates a different picture as a rapid rise in implied volatility levels takes place after the ECB announcement of interest level on 7th August, 2008. ECB's decision not to alter the interest rate resulted in a peaking implied volatility sequencing the event date, which may indicate the markets' expectations of ECB taking action.

Interestingly enough, however, the ECB's bid rate decision appears to exactly equal the analysts' forecast consensus, being 4,25 percent (Forex Factory Database).



Graph 25. ECB interest rate announcement 2nd April, 2009

Graph 25 implies a significantly lower implied volatility levels after a news announcement, namely an interest rate cut on 2nd April, 2009. Introducing the Euro implied volatility level at its highest, this interest rate cut actually affects implied volatility levels precisely as assumed: from its peak two days prior the event itself, Euro implied volatility drops to a level below its three-month average.

5.4.3 Interest rates – a summary

For the Fed interest rate announcements, two cases turned out to have statistical significance. Both of the announcements included interest rate cuts, that is, economy-expanding monetary policy actions. However, implied volatility was not entirely affected as previous studies' results would suggest. Both cases included a regional peak in implied volatility, but not its decrease below average levels afterwards.

In the case of ECB's announcements, some observations back up existing literature's view. Some, however, seem to include market reactions

opposite to the shared belief of removed uncertainty lowering the implied volatility levels after the announcement has been made.

As a conclusion, interest rate announcements clearly have a significant effect on investors' future assessments. As mentioned above, their effect may be dual in nature. It is clear, In the light of these results, that investors not only include the interest rate component in their BSM valuation models. They also pay attention to asset riskiness through implied volatility.

5.5 GDP growth and implied volatility

During the financial crisis, both the US and the Euro area suffered from low or even negative GDP growth. Figures analysed in this section cover monthly GDP growth figures from 2005 to 2009.

5.5.1 Euro area GDP growth

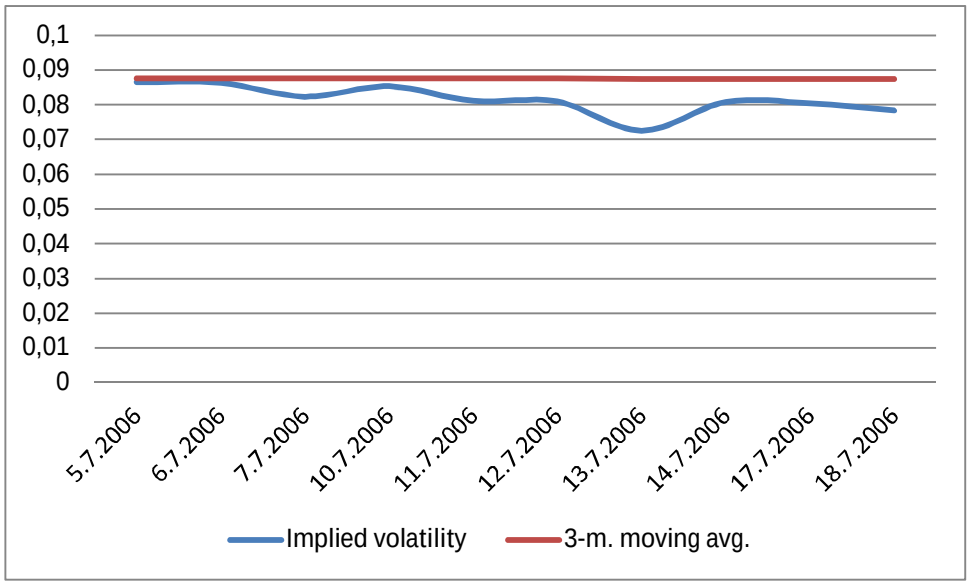
Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-1,753a	-,944b	-,135a	-,405a	-,405a	-,405b	-2,023a
Asymp. Sig. (2-tailed)	0,08	0,345	0,893	0,686	0,686	0,686	0,043
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,944a	-,135b	-1,214a	-,405a	-,405a	-,405b	-1,483a
Asymp. Sig. (2-tailed)	0,345	0,893	0,225	0,686	0,686	0,686	0,138
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-2,023b	-,135b	-1,753b	-,405a	-,944a	-,135a	-1,483a
Asymp. Sig. (2-tailed)	0,043	0,893	0,08	0,686	0,345	0,893	0,138
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,674a	-2,023a	-1,214b	-,135b	-1,214a	-,135a	-,135b
Asymp. Sig. (2-tailed)	0,5	0,043	0,225	0,893	0,225	0,893	0,893
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-1,214b	-2,023b	-,135b	-2,023a	-,944b	-,674a	-,405a
Asymp. Sig. (2-tailed)	0,225	0,043	0,893	0,043	0,345	0,5	0,686
	36b - 36a	37b - 37a	38b - 38a	39b - 39a			
Z	-1,753b	-,135a	-,674b	-2,023a			
Asymp. Sig. (2-tailed)	0,08	0,893	0,5	0,043			

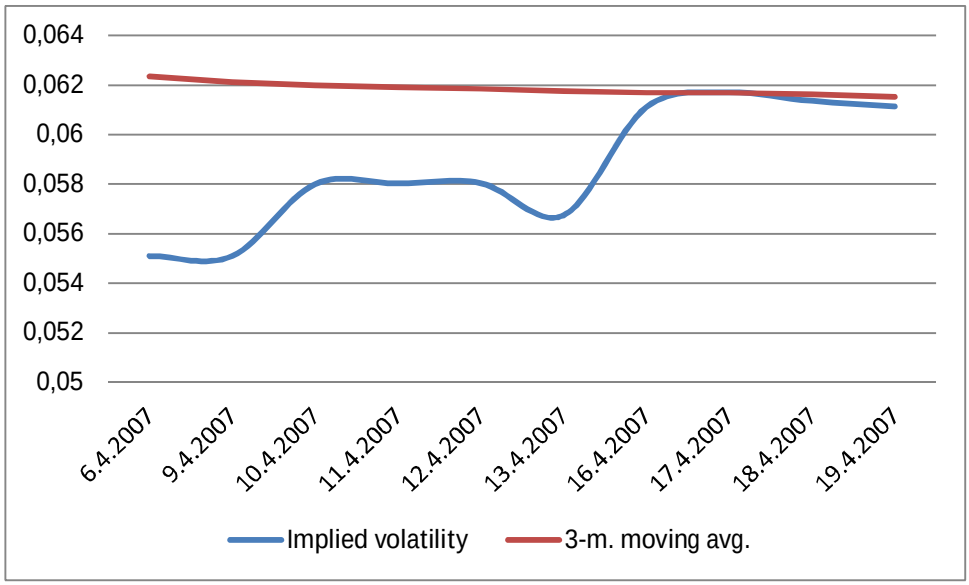
a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Table 10. Results summary for Euro GDP growth

Table 10 above, together with Appendix 7 summarizes the test results for Euro area GDP growth and Euro implied volatility.



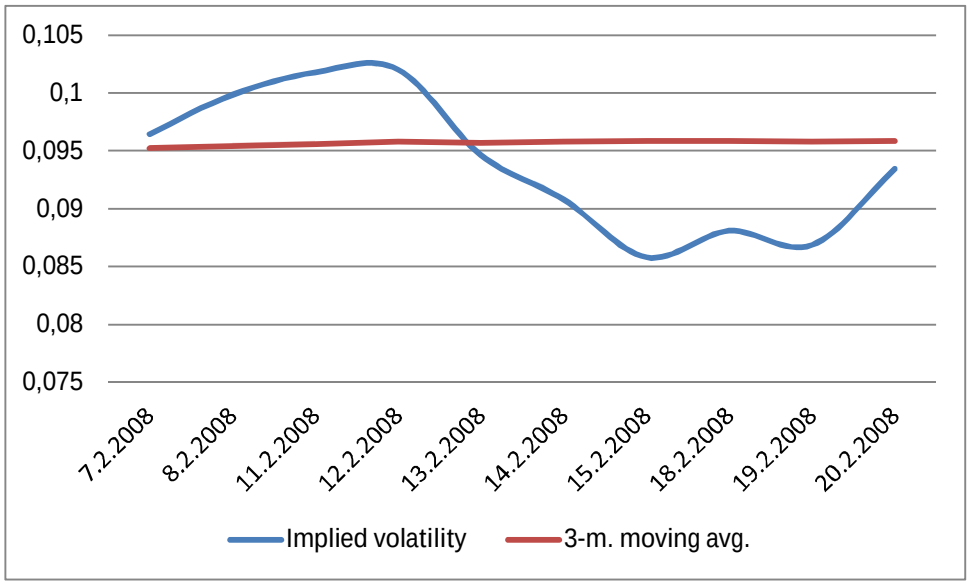
Graph 27. Euro GDP growth announcement 12th July, 2006



Graph 28. Euro GDP growth announcement 13th April, 2007

Both in Graph 27 and 28, the event and its contents were similar: Euro area GDP growth accelerated from the level one month before. These events are reported here to illustrate how the identical news factors with identical content may result in very different results in terms of market reactions.

Still, as illustrated in Graph 28, Euro implied volatility actually decreases on the 13th April, after the news announcement. Contrary to the existing literature on the topic, a considerable peak takes place on the next day. Reasons for the peak may include an effect by another news factor not under attention in this study – or, on the other hand, no rational reason for the market reaction might as well be found.



Graph 29. Euro GDP growth announcement 13th February, 2008

The ECB's decision to leave its key interest rate untouched on 7th February, 2008 followed by a reporter increase in Euro area growth is pictured in Graph 29. In fact, the level of implied volatility around the latter piece of news peaks just prior the announcement. After the uncertainty is removed, implied volatility actually lowers below its three-month moving average levels. These findings set further backup for the previous literature.

As a conclusion, Euro area GDP news factors do have statistical significance from the Euro implied volatility's point of view. At the same time, existing literature receives little backup as the shape of the graphically illustrated implied volatility development varies.

5.5.2 US GDP growth

GDP growth figures from the United States are one of the most relevant indicators of world economy's future development. As a whole, 16 perceptions or announcements of US GDP growth were included in the research period. Out of the 16, five cases turned out to have statistical significance. These are introduced both in Table 11 below and Appendix 8.

Test Statistics(c)

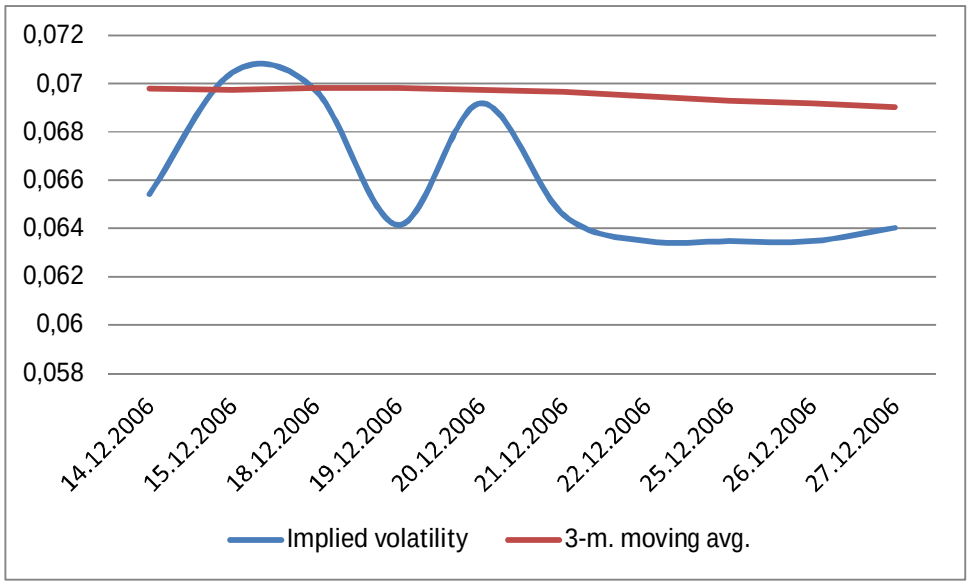
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-1,483a	-1,483b	-,405b	-2,023b	-,135b	-2,023a	-,405a
Asymp. Sig. (2-tailed)	0,138	0,138	0,686	0,043	0,893	0,043	0,686

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753a	-1,483b	-,405a	-1,753a	-2,023b	-,135a	-2,023b
Asymp. Sig. (2-tailed)	0,08	0,138	0,686	0,08	0,043	0,893	0,043

	15b - 15a	16b - 16a
Z	-,674b	-2,023a
Asymp. Sig. (2-tailed)	0,5	0,043

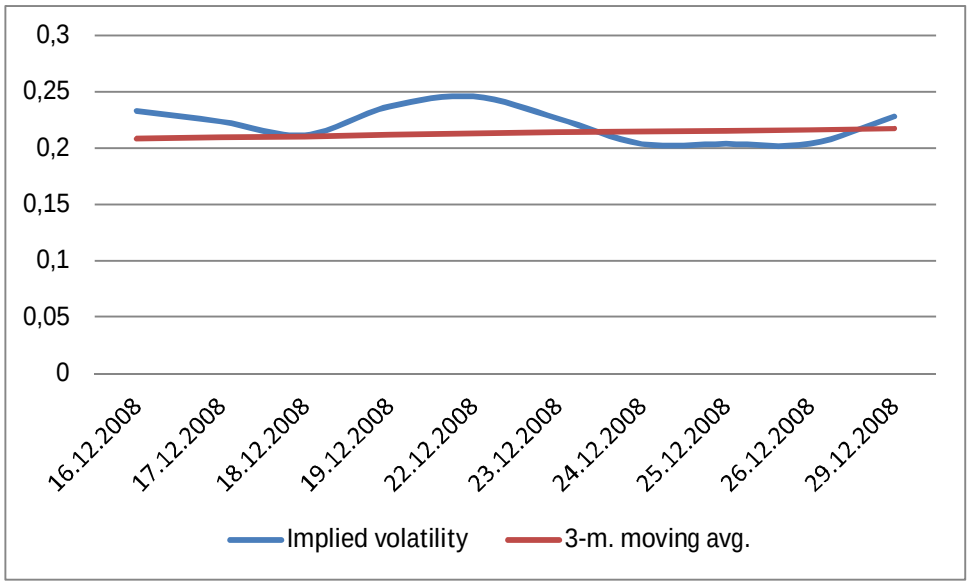
a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

Table 11. ResuIts summary for US GDP growth



Graph 30. US GDP growth announcement on 21st December, 2006

In December 2006, yearly US GDP growth equalled 2 per cent, down from 2,6 on the previous quarter. As graphically illustrated in Graph 30, implied volatility peaks actually twice before the event date. What is important for this study is the second peak on the day prior to the announcement: again, we can see a clear pattern of relieved uncertainty affecting the options markets. The first peak a couple of days before possibly implies the importance investors place on this kind of information, the unease showing in option prices.



Graph 31. US GDP growth announcement on 23rd December, 2008

A similar patter to the one in the previous graph takes place in an event graphed in Graph 31. As US GDP growth was -0,5 per cent, down from 2,8 the previous quarter, the implied volatility peaked on the day before these news was announced. From its all-time-high levels, around 25 per cent, the Euro implied volatility quickly decreased after the announcement was made.

5.5.4 GDP growth – a summary

To sum up, GDP figures provide mixed information on Euro implied volatility behaviour around the announcement dates. Despite having statistical significance, their practical importance appears to be muted in many cases, as the actual change in implied volatility pattern is small.

In addition, as Mann-Whitney-Wilcoxon methodology focuses on distribution equality, a statistically significant search result does not necessarily support the existing literature. However, providing these findings adds to the knowledge a notion that not all macroeconomic news

factors act as a relief to investors, but might even create an atmosphere of further insecurity.

6. Concluding remarks

The purpose of this study is to test whether scheduled US and European macroeconomic news statistically alter markets' view of future Euro riskiness as an investment. The risk level is being mirrored by implied volatility calculated using daily data of USD-nominated at-the-money call options.

Macroeconomic variables selected according to their significance in previous literature concerning implied volatility testing were interest rates, unemployment levels, CPIs, and GDP growth both in US and Euro area. Furthermore, data availability together with data source reliability was taken into account in variable selection.

In statistical testing, Mann-Whitney-Wilcoxon test for distribution similarity was selected. Test results imply the randomness of currency trading and its valuation. No clear pattern for statistical significance was present either for US or European scheduled announcements. However, a tendency of implied volatility to reach a peak slightly before an announcement is being made suggests that, consistent with existing literature on the topic (see i.e. Donders & Vorst, 1996), uncertainty of decisions made by authorities tends to boost risk levels attached to an investment.

For inflation, the effect appears to have more strength in the case of Euro area announcements. Intuitively, it should be this way: investors are making their decisions according to circumstances prevailing in the target area. However, as the US economy is the largest in the world, American news on inflation could be considered an important factor for the Europe as well.

For unemployment, as one-fifth – or ten out of forty-nine perceptions – share of US figures' announcements show statistical significance as far as implied volatility level alterations are concerned, the figure seems relatively low. Euro unemployment figures seem to include some importance as well, eight cases of weekly perceptions being significant.

Most of the significant results appear to provide further backup for previous academic literature (see e.g. Nikkinen et al, 2004). To draw a conclusion, unemployment figures imply to include a significant amount of information according to which derivatives markets assess currency future volatility.

In the case of interest rates, Fed policy effects show mixed results as far as Euro implied volatility is concerned. The changes significant and traceable with statistical procedures seem to back up existing literature's view of implied volatility's tendency to reach its regional high in times of uncertainty around a scheduled announcement with unknown content.

GDP growth figures both in the US and the Euro region provide mixed information on Euro implied volatility behaviour around the announcement dates. Despite having statistical significance, their practical importance appears to be muted in many cases, as the actual change in implied volatility pattern is small.

Thus overall, macroeconomic announcements clearly affect currency option market through interpretations of their contents' importance. A notion well backed up in previous literature, namely the uncertainty-driven implied volatility peak on the announcement day receives some further proof. However, as introduced throughout the results section, investor interpretations vary, potentially for reasons not traceable through econometric methodology.

A clear-cut conclusion of risk level drivers being affected by news factors in a case of currency trading cannot be drawn. Clearly, in a case of European stocks (see i.e. Nikkinen et al, 2006), macroeconomic announcements alter companies' business environment, potentially causing a price shock to hit shares, which results in a more straightforward effects on asset price volatilities.

All in all, paying attention to the timing of all statistically significant events and observations around them, one can conclude that for several years,

financial markets as a whole were considered the most stable, regulated markets in the world. Therefore, an easy and a somewhat naïve mind-set about financial markets' self-correcting nature held ground. Investors appeared to shun most of all macroeconomic news, presumably believing in market efficiency in asset pricing.

Nevertheless, these thoughts and believes were tackled during a world-wide credit crunch and a financial crisis that followed. More and more attention is now paid on macroeconomic news factors, this change in behaviour being turned visible in this study and proved by the vast rise in implied uncertainty. Moreover, neither of the two "hard" currencies goes unstained.

7 Topics for further research

As this study solely focuses on Euro implied volatility, a natural expansion could be examining other markets and currencies as well. For instance, currencies such as Brazilian real, Russian ruble, and a countless number of other free-floating currencies and currency options traded frequently enough would be an exciting field of study.

For the decades to come, the role and significance of US dollar and Euro as strong base currencies will be questioned. As developing economies take further leaps forward, increasing their economic substance, statistically significant results for Euro implied volatility changes may just be ignited by macro shocks taking place in these countries instead of the US.

To be able to reap any benefits from implied volatility applications, one should investigate whether currency options are priced effectively. That is, whenever implied volatility levels peak, option prices should increase for a higher premium needed to cover future uncertainty. This kind of a semi-anomaly, if prevailing, would create a possibility for a risk-free benefit by selling an option at a high price during the implied volatility peak and closing the position by buying an identical option a day or two afterwards. Intuitively, currency options markets' efficiency is at such a high level that no strategy based on a short-term anomaly could be effectively employed.

On the other hand, especially if such an anomaly could be found by using intra-day, high-frequency data, right timing and a substantial options position in monetary terms just might open an opportunity for a trader.

Previous literature, in addition to stressing multiple macroeconomic indicators and their announcement dates, also embraces central bank governors' speeches and see them as an important determinant when it comes to interest rate term structures in medium and long term. These speeches, together with their content, would be an important attachment to mere numerical figures. Intuitively, if these speeches appear to have an

effect on implied volatility, we should come across to a similar phenomenon as with the variables under attention in this study, and also the ones in existing literature: once the uncertainty is gone, volatility levels decline.

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The Appendix

For the entire Appendix section, general rules for results table interpretation apply. Together with each data table, statistically significant results are briefly summarized.

Each data label, i.e. 1b-1a, indicates a single event and its pre-event and post-event periods. A pre-event period is labelled as “a” whereas “b” stands for a post-event period. Not all significant results are graphically analysed: instead, only the ones containing practical importance i.e. a change large enough.

Appendix 1. Euro inflation

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,674a	-1,483a	-,405b	-,135a	-1,753b	-1,490b	-1,214a
Asymp. Sig. (2-tailed)	0,5	0,138	0,686	0,893	0,08	0,136	0,225

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753a	-1,483a	-,135a	-2,023a	-2,023a	-2,023a	-2,032a
Asymp. Sig. (2-tailed)	0,08	0,138	0,893	0,043	0,043	0,043	0,042

	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,674b	-,405b	-2,023b	-,674a	-,944b	-,674a	-,944b
Asymp. Sig. (2-tailed)	0,5	0,686	0,043	0,5	0,345	0,5	0,345

	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-2,023b	-1,214b	-,405a	-1,753b	-2,023b	-,405b	-1,753a
Asymp. Sig. (2-tailed)	0,043	0,225	0,686	0,08	0,043	0,686	0,08

	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-1,214a	-,135b	-,135b	-2,023b	-1,753a	-,135a	-1,753b
Asymp. Sig. (2-tailed)	0,225	0,893	0,893	0,043	0,08	0,893	0,08

	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-1,214a	-2,023b	-,674b	-2,023a	-1,214a	-,405b	-,135b
Asymp. Sig. (2-tailed)	0,225	0,043	0,5	0,043	0,225	0,686	0,893

	43b - 43a	44b - 44a	45b - 45a	46b - 46a
Z	-2,023a	-,944b	-,674b	-1,753b
Asymp. Sig. (2-tailed)	0,043	0,345	0,5	0,08

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 11: Euro inflation down to 1,7 per cent on 17th October, 2006
- 13: Euro inflation down to 1,6 per cent on 16th November, 2006
- 14: Euro inflation up to 1,9 per cent on 15th December, 2006
- 17: Euro inflation up to 1,9 per cent on 16th April, 2007
- 22: Euro area inflation remained at 3,1 per cent on 4th January, 2008

- 26: Euro inflation up to 3,3 per cent on 14th March, 2008
- 32: Euro inflation stable at 4 per cent on 14th August, 2008
- 37: Euro inflation down to 1,6 per cent on 15th January, 2009
- 39: Euro inflation up to 1,2 per cent on 16th March, 2009
- 43: Euro inflation down to -0,1 per cent on 15th July, 2009

Appendix 2. US inflation

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,405a	-2,023b	-1,483b	-,135b	-2,023a	-1,490a	-1,214b
Asymp. Sig. (2-tailed)	0,686	0,043	0,138	0,893	0,043	0,136	0,225

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753b	-1,214b	-,135b	-1,753b	-2,023b	-2,023b	-2,023b
Asymp. Sig. (2-tailed)	0,08	0,225	0,893	0,08	0,043	0,043	0,043

	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,405a	-,944a	-1,753a	-,135a	-1,483b	-1,214b	-,944a
Asymp. Sig. (2-tailed)	0,686	0,345	0,08	0,893	0,138	0,225	0,345

	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,674a	-2,023a	-,944a	-2,023a	-1,214a	-1,483b	-2,023a
Asymp. Sig. (2-tailed)	0,5	0,043	0,345	0,043	0,225	0,138	0,043

	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-,405a	-,944b	-,135a	-,135a	-,135a	-2,023a	-,405b
Asymp. Sig. (2-tailed)	0,686	0,345	0,893	0,893	0,893	0,043	0,686

	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-,944b	-1,214b	-2,023a	-,405a	-2,023b	-,135b	-,405a
Asymp. Sig. (2-tailed)	0,345	0,225	0,043	0,686	0,043	0,893	0,686

	43b - 43a	44b - 44a	45b - 45a	46b - 46a	47b - 47a
Z	-,135a	-2,023b	-,944a	-1,753a	-1,753a
Asymp. Sig. (2-tailed)	0,893	0,043	0,345	0,08	0,08

a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 2: US CPI decrease on 18th January, 2006
- 5: US CPI increase on 19th April, 2006
- 12: US CPI decrease on 16th November, 2006
- 13: US CPI decrease on 15th December, 2006

- 14: US CPI increase on 18th January, 2007
- 23: US CPI increase on 17th October, 2007
- 25: US CPI increase on 14th December, 2007
- 28: US CPI increase on 14th March, 2008
- 34: US CPI decrease on 16th September, 2008
- 38: US CPI increase on 20th February, 2009
- 40: US CPI increase on 15th April, 2009
- 44: US CPI decrease on 14th August, 2009

Appendix 3. US unemployment

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,944a	-,944a	-,405b	-,135b	-1,753a	-1,214a	-1,214a
Asymp. Sig. (2-tailed)	0,345	0,345	0,686	0,893	0,08	0,225	0,225
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,135a	-,405a	-,944a	-1,214b	-1,483b	-1,214a	-2,023a
Asymp. Sig. (2-tailed)	0,893	0,686	0,345	0,225	0,138	0,225	0,043
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-1,753a	-,405b	-,674a	-,674a	-,405b	-1,483b	-,674b
Asymp. Sig. (2-tailed)	0,08	0,686	0,5	0,5	0,686	0,138	0,5
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,944a	-1,753a	-,944a	-2,023a	-1,753a	-1,214a	-1,753b
Asymp. Sig. (2-tailed)	0,345	0,08	0,345	0,043	0,08	0,225	0,08
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-2,023a	-2,023a	-1,483b	-1,214a	-1,483a	-2,023b	-,944b
Asymp. Sig. (2-tailed)	0,043	0,043	0,138	0,225	0,138	0,043	0,345
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-,674a	-2,023a	-2,023a	-,944a	-1,483a	-2,023a	-1,214b
Asymp. Sig. (2-tailed)	0,5	0,043	0,043	0,345	0,138	0,043	0,225
	43b - 43a	44b - 44a	45b - 45a	46b - 46a	47b - 47a	48b - 48a	49b - 49a
Z	-1,483a	-2,023a	-2,023a	-1,483b	-,405a	-1,483a	-2,023a
Asymp. Sig. (2-tailed)	0,138	0,043	0,043	0,138	0,686	0,138	0,043

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 14: US unemployment stable at 4,5 per cent on 5th January, 2007
- 25: US unemployment stable at 4,7 per cent on 7th December, 2007
- 29: US unemployment up to 5,1 per cent on 4th April, 2008
- 30: US unemployment down to 5,0 per cent on 2nd May, 2008
- 34: US unemployment up to 6,1 per cent on 5th September, 2008
- 37: US unemployment up to 6,8 per cent on 5th December, 2008

- 38: US unemployment up to 7,2 per cent on 9th January, 2009
- 41: US unemployment up to 8,5 per cent on 3rd April, 2009
- 44: US unemployment up to 9,5 per cent on 2nd July, 2009
- 45: US unemployment down to 9,4 per cent on 7th August, 2009
- 49: US unemployment down to 10,0 per cent on 4th December, 2009

Appendix 4. Euro unemployment

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,944a	-,674b	-,135b	-,944b	-,135b	-1,483a	-,944a
Asymp. Sig. (2-tailed)	0,345	0,5	0,893	0,345	0,893	0,138	0,345
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753b	-,944a	-,135b	-1,483b	-1,753a	-2,023a	-,405b
Asymp. Sig. (2-tailed)	0,08	0,345	0,893	0,138	0,08	0,043	0,686
	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-,674b	-1,483a	-,135b	-,405b	-1,753b	-2,023b	-,944b
Asymp. Sig. (2-tailed)	0,5	0,138	0,893	0,686	0,08	0,043	0,345
	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,135a	-,674a	-1,753a	-2,023a	-1,753b	-,674a	-,674a
Asymp. Sig. (2-tailed)	0,893	0,5	0,08	0,043	0,08	0,5	0,5
	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-,405a	-1,214b	-,135b	-,674b	-,944a	-1,753a	-2,023a
Asymp. Sig. (2-tailed)	0,686	0,225	0,893	0,5	0,345	0,08	0,043
	36b - 36a	37b - 37a	38b - 38a	39b - 39a	40b - 40a	41b - 41a	42b - 42a
Z	-1,214a	-2,023a	-2,023a	-,674b	-1,214b	-2,023a	-2,023b
Asymp. Sig. (2-tailed)	0,225	0,043	0,043	0,5	0,225	0,043	0,043
	43b - 43a	44b - 44a	45b - 45a	46b - 46a			
Z	-,674b	-,674a	-1,483b	-,674a			
Asymp. Sig. (2-tailed)	0,5	0,5	0,138	0,5			

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 13: Euro unemployment down to 7,7 per cent on 5th January, 2007
- 20: Euro unemployment down to 6,9 per cent on 31st July, 2007
- 25: Euro unemployment stable at 7,2 per cent on 7th January, 2008
- 35: Euro unemployment up to 7,8 per cent on 8th January, 2009
- 37: Euro unemployment up to 8,2 per cent on 27th February, 2009
- 38: Euro unemployment up to 8,5 per cent on 1st April, 2009
- 41: Euro unemployment up to 9,5 per cent on 2nd July, 2009
- 42: Euro unemployment down to 9,4 per cent on 31st July, 2009

Appendix 5. US interest rate

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-,674a	-,674b	-,405a	-,944a	-,405b	-2,023a	-,405a
Asymp. Sig. (2-tailed)	0,5	0,5	0,686	0,345	0,686	0,043	0,686

	8b - 8a	9b - 9a	10b - 10a
Z	-1,214a	-2,023a	-1,483b
Asymp. Sig. (2-tailed)	0,225	0,043	0,138

a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 6: Fed left interest rate untouched on 25th June, 2008
- 9: Fed left interest rate untouched on 28th January, 2009

Appendix 6. Euro interest rate

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-2,023a	-,674a	-,405b	-1,483b	-1,214a	-1,214a	-2,023a
Asymp. Sig. (2-tailed)	0,043	0,5	0,686	0,138	0,225	0,225	0,043

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,674a	-,944b	-2,023b	-1,214b	-1,214a	-2,023b	-1,214b
Asymp. Sig. (2-tailed)	0,5	0,345	0,043	0,225	0,225	0,043	0,225

	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a
Z	-1,483a	-1,753a	-1,214a	-1,214a	-1,753a	-2,023a
Asymp. Sig. (2-tailed)	0,138	0,08	0,225	0,225	0,08	0,043

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 1: ECB left interest rate untouched on 8th February, 2007
- 7: ECB left interest rate untouched on 6th December, 2007
- 10: ECB left interest rate untouched on 6th March, 2008
- 13: ECB left interest rate untouched on 7th August, 2008
- 20: ECB cuts interest rate on 2nd April, 2009

Appendix 7. Euro GDP growth

Test Statistics(c)

	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-1,753a	-,944b	-,135a	-,405a	-,405a	-,405b	-2,023a
Asymp. Sig. (2-tailed)	0,08	0,345	0,893	0,686	0,686	0,686	0,043

	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-,944a	-,135b	-1,214a	-,405a	-,405a	-,405b	-1,483a
Asymp. Sig. (2-tailed)	0,345	0,893	0,225	0,686	0,686	0,686	0,138

	15b - 15a	16b - 16a	17b - 17a	18b - 18a	19b - 19a	20b - 20a	21b - 21a
Z	-2,023b	-,135b	-1,753b	-,405a	-,944a	-,135a	-1,483a
Asymp. Sig. (2-tailed)	0,043	0,893	0,08	0,686	0,345	0,893	0,138

	22b - 22a	23b - 23a	24b - 24a	25b - 25a	26b - 26a	27b - 27a	28b - 28a
Z	-,674a	-2,023a	-1,214b	-,135b	-1,214a	-,135a	-,135b
Asymp. Sig. (2-tailed)	0,5	0,043	0,225	0,893	0,225	0,893	0,893

	29b - 29a	30b - 30a	31b - 31a	32b - 32a	33b - 33a	34b - 34a	35b - 35a
Z	-1,214b	-2,023b	-,135b	-2,023a	-,944b	-,674a	-,405a
Asymp. Sig. (2-tailed)	0,225	0,043	0,893	0,043	0,345	0,5	0,686

	36b - 36a	37b - 37a	38b - 38a	39b - 39a
Z	-1,753b	-,135a	-,674b	-2,023a
Asymp. Sig. (2-tailed)	0,08	0,893	0,5	0,043

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 7: Euro GDP growth positive 12th July, 2006
- 15: Euro GDP growth positive on 13th April, 2007
- 23: Euro GDP growth positive on 14th February, 2008
- 30: Euro GDP growth negative on 8th October, 2008
- 32: Euro GDP growth negative on 4th December, 2008
- 39: Euro GDP growth negative on 8th July, 2009

Appendix 8. US GDP growth

Test Statistics(c)							
	1b - 1a	2b - 2a	3b - 3a	4b - 4a	5b - 5a	6b - 6a	7b - 7a
Z	-1,483a	-1,483b	-,405b	-2,023b	-,135b	-2,023a	-,405a
Asymp. Sig. (2-tailed)	0,138	0,138	0,686	0,043	0,893	0,043	0,686
	8b - 8a	9b - 9a	10b - 10a	11b - 11a	12b - 12a	13b - 13a	14b - 14a
Z	-1,753a	-1,483b	-,405a	-1,753a	-2,023b	-,135a	-2,023b
Asymp. Sig. (2-tailed)	0,08	0,138	0,686	0,08	0,043	0,893	0,043
	15b - 15a	16b - 16a					
Z	-,674b	-2,023a					
Asymp. Sig. (2-tailed)	0,5	0,043					

a. Based on negative ranks.
b. Based on positive ranks.
c. Wilcoxon Signed Ranks Test

Statistically significant (at 95 % confidence level) announcements:

- 4: US GDP growth at 2 per cent p.a. on 21st December, 2006
- 6: US GDP growth 0,7 per cent p.a. on 28th June, 2007
- 12: US GDP growth -0,5 p.a. on 23rd December, 2008
- 14: US GDP growth -5,5 per cent p.a. on 25th June, 2009
- 16: US GDP growth 2,2 per cent p.a. on 22nd December, 2009

Appendix 9.

Date	US market news	Euro region market news
17.11.05		
18.11.05		
19.11.05		
20.11.05		
21.11.05		
22.11.05		
23.11.05		
24.11.05		
25.11.05		
26.11.05		
27.11.05		
28.11.05		
29.11.05		
30.11.05		Euro GDP up
01.12.05		
02.12.05	US Unemployment unchanged at 5 %	
03.12.05		
04.12.05		
05.12.05		
06.12.05		
07.12.05		
08.12.05		
09.12.05		
10.12.05		
11.12.05		
12.12.05		
13.12.05		
14.12.05		
15.12.05	US CPI: decrease	
16.12.05		Euro inflation down to 2,3 %
17.12.05		
18.12.05		
19.12.05		
20.12.05		
21.12.05		
22.12.05		
23.12.05		
24.12.05		
25.12.05		
26.12.05		
27.12.05		
28.12.05		
29.12.05		
30.12.05		
31.12.05		
01.01.06		
02.01.06		
03.01.06		
04.01.06		
05.01.06		

06.01.06	US Unemployment down to 4,9 %	Euro unemployment unchanged at 8,3 %
07.01.06		
08.01.06		
09.01.06		
10.01.06		
11.01.06		
12.01.06		
13.01.06		Euro GDP up
14.01.06		
15.01.06		
16.01.06		
17.01.06		
18.01.06	US CPI: decrease	
19.01.06		Euro inflation down to 2,2 %
20.01.06		
21.01.06		
22.01.06		
23.01.06		
24.01.06		
25.01.06		
26.01.06		
27.01.06		
28.01.06		
29.01.06		
30.01.06		
31.01.06		
01.02.06		Euro unemployment up to 8,4 %
02.02.06		
03.02.06	US Unemployment down to 4,7 %	
04.02.06		
05.02.06		
06.02.06		
07.02.06		
08.02.06		
09.02.06		
10.02.06		
11.02.06		
12.02.06		
13.02.06		
14.02.06		Euro GDP up
15.02.06		
16.02.06		
17.02.06		
18.02.06		
19.02.06		
20.02.06		
21.02.06		
22.02.06	US CPI: increase	
23.02.06		
24.02.06		
25.02.06		
26.02.06		
27.02.06		

28.02.06		Euro inflation up tp 2,4 %
01.03.06		Euro unemployment down to 8,3 %
02.03.06		
03.03.06		Euro GDP up
04.03.06		
05.03.06		
06.03.06		
07.03.06		
08.03.06		
09.03.06		
10.03.06	US Unemployment up to 4,8 %	
11.03.06		
12.03.06		
13.03.06		
14.03.06		
15.03.06		
16.03.06	US CPI: increase	Euro inflation down to 2,3 %
17.03.06		
18.03.06		
19.03.06		
20.03.06		
21.03.06		
22.03.06		
23.03.06		
24.03.06		
25.03.06		
26.03.06		
27.03.06		
28.03.06		
29.03.06		
30.03.06	US GDP growth 1,7 % p.a	
31.03.06		
01.04.06		
02.04.06		
03.04.06		
04.04.06		Euro unemployment down to 8,2 %
05.04.06		
06.04.06		
07.04.06	US Unemployment down to 4,7 %	
08.04.06		
09.04.06		
10.04.06		
11.04.06		
12.04.06		Euro GDP up
13.04.06		
14.04.06		
15.04.06		
16.04.06		
17.04.06		
18.04.06		
19.04.06	US CPI: increase	
20.04.06		Euro inflation down to 2,2 %
21.04.06		

22.04.06			
23.04.06			
24.04.06			
25.04.06			
26.04.06			
27.04.06			
28.04.06			
29.04.06			
30.04.06			
01.05.06			
02.05.06			
03.05.06		Euro unemployment down to 8,1 %	
04.05.06			
05.05.06	US Unemployment unchanged at 4,7 %		
06.05.06			
07.05.06			
08.05.06			
09.05.06			
10.05.06			
11.05.06		Euro GDP up	
12.05.06			
13.05.06			
14.05.06			
15.05.06			
16.05.06			
17.05.06	US CPI: increase	Euro inflation up to 2,4 %	
18.05.06			
19.05.06			
20.05.06			
21.05.06			
22.05.06			
23.05.06			
24.05.06			
25.05.06			
26.05.06			
27.05.06			
28.05.06			
29.05.06	US GDP growth 5,6 % p.a		
30.05.06			
31.05.06			
01.06.06		Euro unemployment down to 8,0 %	Euro GDP up
02.06.06	US Unemployment down to 4,6 %		
03.06.06			
04.06.06			
05.06.06			
06.06.06			
07.06.06			
08.06.06			
09.06.06			
10.06.06			
11.06.06			
12.06.06			
13.06.06			

14.06.06	US CPI: increase	
15.06.06		Euro inflation up to 2,5 %
16.06.06		
17.06.06		
18.06.06		
19.06.06		
20.06.06		
21.06.06		
22.06.06		
23.06.06		
24.06.06		
25.06.06		
26.06.06		
27.06.06		
28.06.06		
29.06.06		
30.06.06		
01.07.06		
02.07.06		
03.07.06		Euro unemployment down to 7,9 %
04.07.06		
05.07.06		
06.07.06		
07.07.06	US Unemployment unchanged at 4,6 %	
08.07.06		
09.07.06		
10.07.06		
11.07.06		
12.07.06		Euro GDP up
13.07.06		
14.07.06		
15.07.06		
16.07.06		
17.07.06		Euro inflation stable at 2,5 %
18.07.06		
19.07.06	US CPI: increase	
20.07.06		
21.07.06		
22.07.06		
23.07.06		
24.07.06		
25.07.06		
26.07.06		
27.07.06		
28.07.06		
29.07.06		
30.07.06		
31.07.06		
01.08.06		Euro unemployment down to 7,8 %
02.08.06		
03.08.06		
04.08.06	US Unemployment up to 4,8 %	
05.08.06		

06.08.06			
07.08.06			
08.08.06			
09.08.06			
10.08.06			
11.08.06			
12.08.06			
13.08.06			
14.08.06		Euro GDP up	
15.08.06			
16.08.06	US CPI: increase		
17.08.06		Euro inflation down to 2,4 %	
18.08.06			
19.08.06			
20.08.06			
21.08.06			
22.08.06			
23.08.06			
24.08.06			
25.08.06			
26.08.06			
27.08.06			
28.08.06			
29.08.06			
30.08.06			
31.08.06			
01.09.06	US Unemployment down to 4,7 %	Euro unemployment stable at 7,8 %	Euro GDP up
02.09.06			
03.09.06			
04.09.06			
05.09.06			
06.09.06			
07.09.06			
08.09.06			
09.09.06			
10.09.06			
11.09.06			
12.09.06			
13.09.06			
14.09.06			
15.09.06	US CPI: increase	Euro inflation down to 2,3 %	
16.09.06			
17.09.06			
18.09.06			
19.09.06			
20.09.06			
21.09.06			
22.09.06			
23.09.06			
24.09.06			
25.09.06			
26.09.06			
27.09.06			

28.09.06	US GDP growth 2,6 % p.a	
29.09.06		
30.09.06		
01.10.06		
02.10.06		
03.10.06		Euro unemployment up to 7,9 %
04.10.06		
05.10.06		
06.10.06	US Unemployment down to 4,6 %	
07.10.06		
08.10.06		
09.10.06		
10.10.06		
11.10.06		Euro GDP up
12.10.06		
13.10.06		
14.10.06		
15.10.06		
16.10.06		
17.10.06		Euro inflation down to 1,7 %
18.10.06	US CPI: decrease	
19.10.06		
20.10.06		
21.10.06		
22.10.06		
23.10.06		
24.10.06		
25.10.06		
26.10.06		
27.10.06		
28.10.06		
29.10.06		
30.10.06		
31.10.06		
01.11.06		
02.11.06		
03.11.06	US Unemployment down to 4,4 %	Euro unemployment up to 7,9 %
04.11.06		
05.11.06		
06.11.06		
07.11.06		
08.11.06		
09.11.06		
10.11.06		
11.11.06		
12.11.06		
13.11.06		
14.11.06		Euro GDP up
15.11.06		
16.11.06	US CPI: decrease	Euro inflation down to 1,6 %
17.11.06		
18.11.06		
19.11.06		

20.11.06		
21.11.06		
22.11.06		
23.11.06		
24.11.06		
25.11.06		
26.11.06		
27.11.06		
28.11.06		
29.11.06		
30.11.06		Euro GDP up
01.12.06		Euro unemployment down to 7,7 %
02.12.06		
03.12.06		
04.12.06		
05.12.06		
06.12.06		
07.12.06		
08.12.06	US Unemployment up to 4,5 %	
09.12.06		
10.12.06		
11.12.06		
12.12.06		
13.12.06		
14.12.06		
15.12.06	US CPI: decrease	Euro inflation up to 1,9 %
16.12.06		
17.12.06		
18.12.06		
19.12.06		
20.12.06		
21.12.06	US GDP growth 2 % p.a	
22.12.06		
23.12.06		
24.12.06		
25.12.06		
26.12.06		
27.12.06		
28.12.06		
29.12.06		
30.12.06		
31.12.06		
01.01.07		
02.01.07		
03.01.07		
04.01.07		
05.01.07	US Unemployment unchanged at 4,5 %	Euro unemployment down to 7,6 %
06.01.07		
07.01.07		
08.01.07		
09.01.07		
10.01.07		
11.01.07		Euro GDP up

12.01.07			
13.01.07			
14.01.07			
15.01.07			
16.01.07			
17.01.07		Euro inflation stable at 1,9 %	
18.01.07	US CPI: increase		
19.01.07			
20.01.07			
21.01.07			
22.01.07			
23.01.07			
24.01.07			
25.01.07			
26.01.07			
27.01.07			
28.01.07			
29.01.07			
30.01.07		French budget EU eligible at last	
31.01.07		Euro unemployment down to 7,5 %	
01.02.07			
02.02.07	US Unemployment up to 4,6 %		
03.02.07			
04.02.07			
05.02.07			
06.02.07			
07.02.07			
08.02.07		ECB left interest rate untouched	
09.02.07			
10.02.07			
11.02.07			
12.02.07			
13.02.07		Euro GDP up	
14.02.07			
15.02.07			
16.02.07			
17.02.07			
18.02.07			
19.02.07			
20.02.07			
21.02.07	US CPI: increase		
22.02.07			
23.02.07			
24.02.07			
25.02.07			
26.02.07			
27.02.07			
28.02.07		Euro unemployment down to 7,4 %	Euro inflation down to 1,8 %
01.03.07			
02.03.07			
03.03.07			
04.03.07			
05.03.07			

06.03.07		Euro GDP up
07.03.07		
08.03.07		
09.03.07	US Unemployment down to 4,5 %	
10.03.07		
11.03.07		
12.03.07		
13.03.07		
14.03.07		
15.03.07		Euro inflation stable at 1,8 %
16.03.07	US CPI: increase	
17.03.07		
18.03.07		
19.03.07		
20.03.07		
21.03.07		
22.03.07		
23.03.07		
24.03.07		
25.03.07		
26.03.07		
27.03.07		
28.03.07		
29.03.07	US GDP growth 2,5 % p.a	
30.03.07		
31.03.07		
01.04.07		
02.04.07		Euro unemployment down to 7,3 %
03.04.07		
04.04.07		
05.04.07		
06.04.07	US Unemployment down to 4,4 %	
07.04.07		
08.04.07		
09.04.07		
10.04.07		
11.04.07		
12.04.07		
13.04.07		Euro GDP up
14.04.07		
15.04.07		
16.04.07		Euro inflation up to 1,9 %
17.04.07	US CPI: increase	
18.04.07		
19.04.07		
20.04.07		
21.04.07		
22.04.07		
23.04.07		
24.04.07		
25.04.07		
26.04.07		
27.04.07		Euro record high (1,3682 USD/Euro)

28.04.07			
29.04.07			
30.04.07			
01.05.07			
02.05.07		Euro unemployment down to 7,2 %	
03.05.07			
04.05.07	US Unemployment up to 4,5 %		
05.05.07			
06.05.07			
07.05.07			
08.05.07			
09.05.07			
10.05.07		ECB left interest rate untouched	
11.05.07			
12.05.07			
13.05.07			
14.05.07			
15.05.07	US CPI: increase	Euro GDP up	
16.05.07		Euro inflation stable at 1,9 %	
17.05.07			
18.05.07			
19.05.07			
20.05.07			
21.05.07			
22.05.07			
23.05.07			
24.05.07			
25.05.07		Nasdaq to buy OMX	
26.05.07			
27.05.07			
28.05.07			
29.05.07			
30.05.07			
31.05.07	US economic growth slowest in four years		Euro inflation remained constant
01.06.07	US Unemployment unchanged at 4,5 %	Euro unemployment down to 7,1 %	Euro GDP up
02.06.07			
03.06.07			
04.06.07			
05.06.07			
06.06.07		ECB to raise interest level	
07.06.07			
08.06.07			
09.06.07			
10.06.07			
11.06.07			
12.06.07			
13.06.07			
14.06.07			
15.06.07	US CPI: increase		
16.06.07			
17.06.07			
18.06.07			

19.06.07		
20.06.07		
21.06.07		
22.06.07		
23.06.07		
24.06.07		
25.06.07		
26.06.07		
27.06.07		
28.06.07	US GDP growth 0,7 % p.a	
29.06.07		
30.06.07		
01.07.07		
02.07.07		
03.07.07		Euro unemployment down to 7,0 %
04.07.07		
05.07.07		ECB left interest rate untouched
06.07.07	US Unemployment unchanged at 4,5 %	
07.07.07		
08.07.07		
09.07.07		
10.07.07		
11.07.07		
12.07.07		Euro GDP up
13.07.07		
14.07.07		
15.07.07		
16.07.07		Euro inflation stable at 1,9 %
17.07.07		
18.07.07	US CPI: increase	
19.07.07		
20.07.07		
21.07.07		
22.07.07		
23.07.07		
24.07.07		
25.07.07		
26.07.07		
27.07.07		
28.07.07		
29.07.07		
30.07.07		
31.07.07		Euro unemployment down to 6,9 %
01.08.07		
02.08.07		
03.08.07	US Unemployment up to 4,6 %	
04.08.07		
05.08.07		
06.08.07		
07.08.07	FED left interest rate untouched	
08.08.07		
09.08.07		
10.08.07		

11.08.07			
12.08.07			
13.08.07			
14.08.07		Euro area econ growth slows down	Euro GDP up
15.08.07	US CPI: unchanged		
16.08.07			
17.08.07			
18.08.07			
19.08.07			
20.08.07			
21.08.07			
22.08.07			
23.08.07			
24.08.07			
25.08.07			
26.08.07			
27.08.07			
28.08.07			
29.08.07	FED & ECB to boost the economy & banking sector		
30.08.07			
31.08.07		Euro unemployment stable at 6,9 %	
01.09.07			
02.09.07			
03.09.07			
04.09.07		Euro GDP up	
05.09.07			
06.09.07		ECB left interest rate untouched	
07.09.07	US Unemployment unchanged at 4,6 %		
08.09.07			
09.09.07			
10.09.07			
11.09.07			
12.09.07			
13.09.07			
14.09.07			
15.09.07			
16.09.07			
17.09.07			
18.09.07			
19.09.07	US CPI: decrease		
20.09.07			
21.09.07			
22.09.07			
23.09.07			
24.09.07			
25.09.07	IMF: financial markets about to stabilize again		
26.09.07			
27.09.07	US GDP growth 3,8 % p.a		
28.09.07			
29.09.07			
30.09.07			
01.10.07			
02.10.07		Euro unemployment stable at 6,9 %	

03.10.07		
04.10.07		ECB left interest rate untouched
05.10.07	US Unemployment up to 4,7 %	
06.10.07		
07.10.07	Greenspan: US economic growth about to slow down	
08.10.07		
09.10.07		
10.10.07		
11.10.07		Euro GDP up
12.10.07		
13.10.07		
14.10.07		
15.10.07		
16.10.07		
17.10.07	US CPI: increase	
18.10.07		
19.10.07		
20.10.07		
21.10.07		
22.10.07		
23.10.07		
24.10.07		
25.10.07		
26.10.07		
27.10.07		
28.10.07		
29.10.07		
30.10.07		
31.10.07	FED drops interest rate	Euro unemployment up to 7,3 %
01.11.07		
02.11.07	US Unemployment unchanged at 4,7 %	
03.11.07		
04.11.07		
05.11.07		
06.11.07		
07.11.07		
08.11.07		
09.11.07		
10.11.07		
11.11.07		
12.11.07		
13.11.07		
14.11.07		Euro GDP up
15.11.07	US CPI: increase	Euro inflation up to 2,6 %
16.11.07		
17.11.07		
18.11.07		
19.11.07		
20.11.07		
21.11.07		
22.11.07		
23.11.07		
24.11.07		

25.11.07		
26.11.07		Estonia rumoured to devalue Krooni
27.11.07		
28.11.07		
29.11.07		
30.11.07		Euro GDP up
01.12.07		
02.12.07		
03.12.07		Euro unemployment down to 7,2 %
04.12.07		
05.12.07		
06.12.07		ECB left interest rate untouched
07.12.07	US Unemployment unchanged at 4,7 %	
08.12.07		
09.12.07		
10.12.07		
11.12.07	FED drops interest rate	
12.12.07		
13.12.07		
14.12.07	US CPI: increase	Euro inflation up to 3,1 %
15.12.07		
16.12.07		
17.12.07		
18.12.07		
19.12.07		
20.12.07	US GDP growth 4,9 % p.a	
21.12.07		
22.12.07		
23.12.07		
24.12.07		
25.12.07		
26.12.07		
27.12.07		
28.12.07		
29.12.07		
30.12.07		
31.12.07		
01.01.08		Malta & Cyprus to adopt Euros
02.01.08		
03.01.08		
04.01.08	US Unemployment up to 5 %	Euro area inflation remained at 3,1 percent
05.01.08		
06.01.08		
07.01.08		Euro unemployment stable at 7,2 %
08.01.08		
09.01.08		Euro GDP up
10.01.08		ECB left interest rate untouched
11.01.08		
12.01.08		
13.01.08		
14.01.08		
15.01.08		
16.01.08	US CPI: decrease	Euro inflation stable at 3,1 %

17.01.08			
18.01.08			
19.01.08			
20.01.08			
21.01.08			
22.01.08	FED drops interest rate sharply		
23.01.08			
24.01.08			
25.01.08			
26.01.08			
27.01.08			
28.01.08			
29.01.08	Rumours of FED interest rate cut		
30.01.08	FED drops interest rate		
31.01.08		Euro inflation hits 3,2 percent	Euro unemployment stable at 7,2 %
01.02.08	US Unemployment down to 4,9 %		
02.02.08			
03.02.08			
04.02.08			
05.02.08			
06.02.08			
07.02.08		ECB left interest rate untouched	
08.02.08			
09.02.08			
10.02.08			
11.02.08			
12.02.08			
13.02.08			
14.02.08		Euro GDP up	
15.02.08	US trade deficit diminishes for the first time in years		
16.02.08			
17.02.08			
18.02.08			
19.02.08			
20.02.08	US CPI: increase		
21.02.08		Societe generale: record losses	
22.02.08			
23.02.08			
24.02.08			
25.02.08			
26.02.08			
27.02.08			
28.02.08			
29.02.08		Euro unemployment down to 7,1 %	Euro inflation up to 3,2 %
01.03.08			
02.03.08			
03.03.08			
04.03.08		Euro GDP up	
05.03.08			
06.03.08		ECB left interest rate untouched	
07.03.08	US Unemployment down to 4,8 %		
08.03.08			
09.03.08			

10.03.08		
11.03.08		
12.03.08		
13.03.08		
14.03.08	US CPI: increase	Euro inflation up to 3,3 %
15.03.08		
16.03.08		
17.03.08		
18.03.08	FED cuts interest rate less than expected	
19.03.08		
20.03.08		
21.03.08		
22.03.08		
23.03.08		
24.03.08		
25.03.08		
26.03.08		
27.03.08	US GDP growth 0,6 % p.a	
28.03.08		
29.03.08		
30.03.08		
31.03.08		
01.04.08		Euro unemployment stable at 7,1 %
02.04.08		
03.04.08		
04.04.08	US Unemployment up to 5,1 %	
05.04.08		
06.04.08		
07.04.08		
08.04.08		
09.04.08		Euro GDP up
10.04.08		
11.04.08		
12.04.08		
13.04.08		
14.04.08		
15.04.08		
16.04.08	US CPI: increase	Euro inflation up to 3,6 %
17.04.08		
18.04.08		
19.04.08		
20.04.08		
21.04.08		
22.04.08		
23.04.08		
24.04.08		
25.04.08		
26.04.08		
27.04.08		
28.04.08		
29.04.08		
30.04.08		Euro unemployment stable at 7,1 %
01.05.08		

02.05.08	US Unemployment down to 5 %		
03.05.08			
04.05.08			
05.05.08			
06.05.08			
07.05.08			
08.05.08			
09.05.08			
10.05.08			
11.05.08			
12.05.08			
13.05.08			
14.05.08	US CPI: increase		
15.05.08		Euro inflation down to 3,3 %	Euro GDP up
16.05.08			
17.05.08			
18.05.08			
19.05.08			
20.05.08			
21.05.08			
22.05.08			
23.05.08			
24.05.08			
25.05.08			
26.05.08			
27.05.08			
28.05.08			
29.05.08			
30.05.08		Euro unemployment stable at 7,1 %	
31.05.08			
01.06.08			
02.06.08			
03.06.08		Euro GDP up	
04.06.08			
05.06.08	US depot sales higher than expected	ECB left interest rate untouched	
06.06.08	US Unemployment up to 5,5 %		
07.06.08			
08.06.08			
09.06.08			
10.06.08			
11.06.08			
12.06.08			
13.06.08	US CPI: increase		
14.06.08			
15.06.08			
16.06.08		Euro inflation up to 3,7 %	
17.06.08			
18.06.08			
19.06.08			
20.06.08			
21.06.08			
22.06.08			
23.06.08			

24.06.08			
25.06.08	FED left interest rate untouched		
26.06.08	US GDP growth 1,0 % p.a		
27.06.08			
28.06.08			
29.06.08			
30.06.08		Euro inflation hits new record	
01.07.08		Euro unemployment up to 7,2 %	
02.07.08			
03.07.08	US Unemployment unchanged at 5,5 %	ECB raises interest rate	
04.07.08			
05.07.08			
06.07.08			
07.07.08			
08.07.08			
09.07.08		Euro GDP up	
10.07.08			
11.07.08			
12.07.08	Fifth bank bankrupt due to sub-prime loans		
13.07.08			
14.07.08	Govt to bail out mortgage companies		
15.07.08			
16.07.08	US CPI: increase	Euro inflation hits 4 percent	
17.07.08			
18.07.08			
19.07.08			
20.07.08			
21.07.08			
22.07.08			
23.07.08			
24.07.08			
25.07.08			
26.07.08			
27.07.08			
28.07.08			
29.07.08			
30.07.08		Euro confidence index plunged	
31.07.08			Euro unemployment up to 7,3 %
01.08.08	US Unemployment up to 5,7 %		
02.08.08			
03.08.08			
04.08.08			
05.08.08			
06.08.08			
07.08.08		ECB left interest rate untouched	
08.08.08			
09.08.08			
10.08.08			
11.08.08			
12.08.08			
13.08.08			
14.08.08	US CPI: increase	Euro inflation stable at 4 %	Euro GDP down
15.08.08			

16.08.08			
17.08.08			
18.08.08			
19.08.08			
20.08.08			
21.08.08			
22.08.08			
23.08.08			
24.08.08			
25.08.08			
26.08.08			
27.08.08			
28.08.08			
29.08.08		Euro unemployment stable at 7,3 %	
30.08.08			
31.08.08			
01.09.08			
02.09.08			
03.09.08		Euro GDP down	
04.09.08		ECB left interest rate untouched	
05.09.08	US Unemployment up to 6,1 %		
06.09.08			
07.09.08			
08.09.08			
09.09.08			
10.09.08			
11.09.08			
12.09.08			
13.09.08			
14.09.08			
15.09.08	Lehman Brothers bankruptcy		
16.09.08	US CPI: decrease	Euro inflation down to 3,8 %	
17.09.08			
18.09.08			
19.09.08			
20.09.08			
21.09.08			
22.09.08			
23.09.08			
24.09.08			
25.09.08			
26.09.08	US GDP growth 2,8 % p.a.		
27.09.08			
28.09.08			
29.09.08			Five Euro banks going down
30.09.08			
01.10.08		Euro unemployment up to 7,5 %	
02.10.08			
03.10.08	US Unemployment unchanged at 6,1 %		
04.10.08			
05.10.08			
06.10.08			
07.10.08			

08.10.08		Euro GDP down	
09.10.08			
10.10.08			
11.10.08			
12.10.08			
13.10.08		Massive support to EU banks	
14.10.08	US budget deficit tripled; Fed starts pumping money into banks		
15.10.08		Euro inflation down to 3,6 %	
16.10.08	US CPI: decrease		
17.10.08			
18.10.08			
19.10.08			
20.10.08			
21.10.08			
22.10.08			
23.10.08			
24.10.08			
25.10.08			
26.10.08			
27.10.08	Capital support to US banks		
28.10.08			
29.10.08	FED to cut interest rate		
30.10.08			
31.10.08		Euro unemployment stable at 7,5 %	
01.11.08			
02.11.08			
03.11.08			
04.11.08			
05.11.08			
06.11.08		ECB cuts interest rate	
07.11.08	US Unemployment up to 6,5 %		
08.11.08			
09.11.08			
10.11.08			
11.11.08			
12.11.08			
13.11.08			
14.11.08		Euro inflation down to 3,2 %	Euro GDP down
15.11.08			
16.11.08			
17.11.08			
18.11.08			
19.11.08	US CPI: decrease		
20.11.08			
21.11.08			
22.11.08			
23.11.08			
24.11.08			
25.11.08	Massive support packages		
26.11.08		Massive support packages	
27.11.08			
28.11.08		Euro unemployment up to 7,7 %	
29.11.08			

30.11.08			
01.12.08			
02.12.08	USA ”officially in a downturn”		
03.12.08			
04.12.08		ECB cuts interest rate	Euro GDP down
05.12.08	US Unemployment up to 6,8 %		
06.12.08			
07.12.08			
08.12.08			
09.12.08			
10.12.08			
11.12.08			
12.12.08			
13.12.08			
14.12.08			
15.12.08			
16.12.08	FED cuts interest rate	US CPI: decrease	
17.12.08		Euro inflation down to 2,1 %	
18.12.08			
19.12.08			
20.12.08			
21.12.08			
22.12.08			
23.12.08	US GDP growth -0,5 % p.a		
24.12.08			
25.12.08			
26.12.08			
27.12.08			
28.12.08			
29.12.08			
30.12.08	Boost to auto industry		
31.12.08	CCI record low		
01.01.09			
02.01.09			
03.01.09			
04.01.09			
05.01.09			
06.01.09			
07.01.09			
08.01.09		Euro unemployment up to 7,8 %	Euro GDP down
09.01.09	US Unemployment up to 7,2 %		
10.01.09			
11.01.09			
12.01.09			
13.01.09			
14.01.09			
15.01.09		ECB cuts interest rate	Euro inflation down to 1,6 %
16.01.09	US CPI: decrease		
17.01.09			
18.01.09			
19.01.09			
20.01.09			
21.01.09			

22.01.09			
23.01.09			
24.01.09			
25.01.09			
26.01.09			
27.01.09			
28.01.09	FED left interest rate untouched		
29.01.09	US house sales figures down		
30.01.09		Euro unemployment up to 8 %	
31.01.09			
01.02.09			
02.02.09			
03.02.09			
04.02.09			
05.02.09		ECB left interest rate untouched	
06.02.09	US Unemployment up to 7,6 %		
07.02.09			
08.02.09			
09.02.09			
10.02.09			
11.02.09			
12.02.09			
13.02.09		Euro GDP down	
14.02.09			
15.02.09			
16.02.09			
17.02.09			
18.02.09	Massive bailout for housing markets		
19.02.09			
20.02.09	US CPI: increase		
21.02.09			
22.02.09			
23.02.09			
24.02.09			
25.02.09			
26.02.09			
27.02.09		Euro unemployment up to 8,2 %	Euro inflation down to 1,1 %
28.02.09			
01.03.09			
02.03.09			
03.03.09			
04.03.09			
05.03.09		ECB cuts interest rate	Euro GDP down
06.03.09	US Unemployment up to 8,1 %		
07.03.09			
08.03.09			
09.03.09			
10.03.09			
11.03.09			
12.03.09			
13.03.09			
14.03.09			
15.03.09			

16.03.09		Euro inflation up to 1,2 %
17.03.09		
18.03.09	US CPI: increase	
19.03.09		
20.03.09		
21.03.09		
22.03.09		
23.03.09		
24.03.09		
25.03.09		
26.03.09	US GDP growth -6,3 % p.a	
27.03.09		
28.03.09		
29.03.09		
30.03.09		
31.03.09		
01.04.09		Euro unemployment up to 8,5 %
02.04.09		ECB cuts interest rate
03.04.09	US Unemployment up to 8,5 %	
04.04.09		
05.04.09		
06.04.09		
07.04.09		Euro GDP down
08.04.09		
09.04.09		
10.04.09		
11.04.09		
12.04.09		
13.04.09		
14.04.09		
15.04.09	US CPI: increase	
16.04.09		Euro inflation down to 0,6 %
17.04.09		
18.04.09		
19.04.09		
20.04.09		
21.04.09		
22.04.09		
23.04.09		
24.04.09		
25.04.09		
26.04.09		
27.04.09		
28.04.09		
29.04.09		
30.04.09		Euro unemployment up to 8,9 %
01.05.09		
02.05.09		
03.05.09		
04.05.09		
05.05.09		
06.05.09		
07.05.09		

08.05.09	US Unemployment up to 8,9 %		
09.05.09			
10.05.09			
11.05.09			
12.05.09			
13.05.09			
14.05.09			
15.05.09	US CPI: increase	Euro inflation stable at 0,6 %	Euro GDP down
16.05.09			
17.05.09			
18.05.09			
19.05.09			
20.05.09			
21.05.09			
22.05.09			
23.05.09			
24.05.09			
25.05.09			
26.05.09			
27.05.09			
28.05.09			
29.05.09			
30.05.09			
31.05.09			
01.06.09			
02.06.09		Euro unemployment up to 9,2 %	
03.06.09		Euro GDP down	
04.06.09			
05.06.09	US Unemployment up to 9,4 %		
06.06.09			
07.06.09			
08.06.09			
09.06.09			
10.06.09			
11.06.09			
12.06.09			
13.06.09			
14.06.09			
15.06.09			
16.06.09		Euro inflation down to 0 %	
17.06.09	US CPI: increase		
18.06.09			
19.06.09			
20.06.09			
21.06.09			
22.06.09			
23.06.09			
24.06.09			
25.06.09	US GDP growth -5,5 % p.a		
26.06.09			
27.06.09			
28.06.09			
29.06.09			

30.06.09		
01.07.09		
02.07.09	US Unemployment up to 9,5 %	Euro unemployment up to 9,5 %
03.07.09		
04.07.09		
05.07.09		
06.07.09		
07.07.09		
08.07.09		Euro GDP down
09.07.09		
10.07.09		
11.07.09		
12.07.09		
13.07.09		
14.07.09		
15.07.09	US CPI: increase	Euro inflation down to -0,1 %
16.07.09		
17.07.09		
18.07.09		
19.07.09		
20.07.09		
21.07.09		
22.07.09		
23.07.09		
24.07.09		
25.07.09		
26.07.09		
27.07.09		
28.07.09		
29.07.09		
30.07.09		
31.07.09		Euro unemployment down to 9,4 %
01.08.09		
02.08.09		
03.08.09		
04.08.09		
05.08.09		
06.08.09		
07.08.09	US Unemployment down to 9,4 %	
08.08.09		
09.08.09		
10.08.09		
11.08.09		
12.08.09		
13.08.09		Euro GDP down
14.08.09	US CPI: decrease	Euro inflation down to -0,7 %
15.08.09		
16.08.09		
17.08.09		
18.08.09		
19.08.09		
20.08.09		
21.08.09		

22.08.09		
23.08.09		
24.08.09		
25.08.09		
26.08.09		
27.08.09		
28.08.09		
29.08.09		
30.08.09		
31.08.09		
01.09.09		Euro unemployment up to 9,5 %
02.09.09		Euro GDP down
03.09.09		
04.09.09	US unemployment up to 9,7 %	
05.09.09		
06.09.09		
07.09.09		
08.09.09		
09.09.09		
10.09.09		
11.09.09		
12.09.09		
13.09.09		
14.09.09		
15.09.09		
16.09.09	US CPI: increase	Euro inflation up to -0,2 %
17.09.09		
18.09.09		
19.09.09		
20.09.09		
21.09.09		
22.09.09		
23.09.09		
24.09.09		
25.09.09		
26.09.09		
27.09.09		
28.09.09		
29.09.09		
30.09.09	US GDP growth -0,7 % p.a (3rd estimate)	
01.10.09		Euro unemployment up to 9,6 %
02.10.09	US Unemployment up to 9,8 %	
03.10.09		
04.10.09		
05.10.09		
06.10.09		
07.10.09		Euro GDP down
08.10.09		
09.10.09		
10.10.09		
11.10.09		
12.10.09		
13.10.09		

14.10.09		
15.10.09	US CPI: increase	Euro inflation down to -0,3 %
16.10.09		
17.10.09		
18.10.09		
19.10.09		
20.10.09		
21.10.09		
22.10.09		
23.10.09		
24.10.09		
25.10.09		
26.10.09		
27.10.09		
28.10.09		
29.10.09		
30.10.09		Euro unemployment up to 9,6 %
31.10.09		
01.11.09		
02.11.09		
03.11.09		
04.11.09		
05.11.09		
06.11.09	US Unemployment up to 10,2 %	
07.11.09		
08.11.09		
09.11.09		
10.11.09		
11.11.09		
12.11.09		
13.11.09		Euro GDP up
14.11.09		
15.11.09		
16.11.09		Euro inflation up to -0,1 %
17.11.09		
18.11.09	US CPI: increase	
19.11.09		
20.11.09		
21.11.09		
22.11.09		
23.11.09		
24.11.09		
25.11.09		
26.11.09		
27.11.09		
28.11.09		
29.11.09		
30.11.09		
01.12.09		Euro unemployment up to 9,8 %
02.12.09		
03.12.09		Euro GDP up
04.12.09	US Unemployment down to 10 %	
05.12.09		

06.12.09		
07.12.09		
08.12.09		
09.12.09		
10.12.09		
11.12.09		
12.12.09		
13.12.09		
14.12.09		
15.12.09		
16.12.09	US CPI: increase	Euro inflation up to 0,5 %
17.12.09		
18.12.09		
19.12.09		
20.12.09		
21.12.09		
22.12.09	US GDP growth 2,2 % p.a	
23.12.09		
24.12.09		
25.12.09		
26.12.09		
27.12.09		
28.12.09		
29.12.09		
30.12.09		
31.12.09		