

ECONOMIC POLICY UNCERTAINTY AND CAPITAL MARKET VOLATILITY

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Abstract *Economic policy uncertainty can influence consumer behavior, investor's perception and the entire economic environment of a country. This paper revisits the relationship between economic policy uncertainty and capital market volatility for emerging and developed economies. We use wavelet-based methodologies to test the influence of uncertain economic policies on the evolution of the capital markets for two developed capital markets between 2000 and 2016. In our analysis, we use the News Implied Volatility Index – NVIX as proxy for uncertainty depicted in news and media. Our result indicates that there is a strong relationship between news that appear in the media and the evolution of developed capital markets, and the effects of economic uncertainty are present in both crisis and non-crisis periods. Furthermore, we find that the effect of economic uncertainty tends to exert a higher influence on long-term development of the capital market, rather than short-term development. Our empirical results emphasize that investors react to inadequate economic policy measures in developed economies, therefore ensuring a predictable and stable economic environment should one the main focuses of policy makers in types of economies. Uncertainty can influence not only economic growth, but also capital market development*

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1. INTRODUCTION

The debates surrounding the relationship between the emergence of new information in media and the evolution of capital markets, takes a special place in the economic literature. Identifying and testing the mechanisms through which the emergence of new information causes reactions in the capital markets, regardless of the nature of information are the focuses of many scholars. Therefore, many studies try to identify the way in which certain categories of information can negatively influence the evolution of capital markets depending on their nature. From information on the general economic climate, legislative changes, political instability or other categories of news are just a few examples, which are tested empirically.

While many studies try to identify the way in which information spreads in developed capital markets based on information published in the press, we need to identify the way in which information influences the evolution of capital markets in both short-term and long-term. In general, the effects induced by the emergence of new information in the market can have a predominant effect on the short-term effect if the information relates to the occurrence of an unusual phenomenon's such as wars or political instability.

Meanwhile on the long run the information presented specialized press can influence in the evolution of developed capital markets (Manela & Moreira, 2017; Boudoukh *et al.*, 2019).

The purpose of this analysis is to identify how the emergence of new information in capital markets influences the evolution of capital markets in Western Europe. While, there are number of studies that deal with the role of different information in the evolution and development of capital markets most focus on the Western European, and use simple DCC-GARCH models. In general, most studies test the role of media for United States of America (Manela & Moreira, 2017) or developed capital markets (Boudoukh *et al.*, 2019; Stotz, 2018), while few studies are for emerging markets (Liu & Zang, 2015; Shi, Ho & Liu, 2016). The motivation for choosing developed is to identify the way in which a less developed and liquid capital markets are more prone to moments of panic from investors, as they react to uncertainty depicted in the press.

In addition, we consider appropriate to conduct this study using a modern method of analysis such as wavelet analysis, because we can test not only the effect of short-term news, but we will also observe the manner in which they influence the evolution of long-term capital markets, on different time horizons from monthly, quarterly or even annually. Therefore, we try to answer the following question: What is the impact of news-based uncertainty on the evolution of capital markets in Western Europe?

The rest of the paper is organized as follows: section 2 marks the review of existing studies, section 3 presents the data, section 4 the methodology used, while section 5 the empirical results, and finally section 6 depicts the conclusions of the study.

2. LITERATURE REVIEW

Concerns about the role of new information in the press on the evolution of capital markets have been a hot topic in the literature in the development of modern portfolio theories, which focus on portfolio risk management and valuation of financial assets. However, the impact of news on capital market volatility has focused on the impact of news on general macroeconomic instability, while the analysis of the impact of news on investor reaction has been a less addressed topic in the literature (Liu & Zang, 2015).

From the first study of Niederhoffer (1971), which highlighted the role of information in the press on the evolution of the stock market or the investment decision, to modern studies such as (Manela & Moreira, 2017; Boudoukh *et al.*, 2019), the analysis of the effects induced by news on the capital markets was a widely debated topic in the literature. While on the first studies on this topic a considerable emphasis was placed on measuring the effects, the modern studies aim not only to test the phenomenon but rather to find methods to combat and predict the phenomenon due to the disruptive effects of some categories of news on the evolution of capital markets. Although there is no unanimous consensus on this topic a number of key factors are presented that can influence the manner in which a capital market reacts to information appearing in the press:

a) **news versus non-news**: in general, the volatility of a company is higher in the case of new news on the evolution of the company than when information appears regarding the general economic climate or other aspects of the evolution of the capital market as a whole. However, in certain situations we may notice a „*delay*” effect or a „*drift delay*” effect depending on the nature of the information. Thus, a drift effect can be observed when

negative news about the evolution of a company appears, while the lack of news about a company with less liquid shares aims at a delay effect (Chan, 2003);

b) **investor pessimism versus company fundamentals**: if the information in the press is generally pessimistic the share price of listed companies can be reduced in the short term, while the absence of pessimistic information increases the role of a company's economic fundamentals. Thus, pessimistic information can lead to a reduction in share prices while their absence can lead to an increase in the volume of transactions and not necessarily an increase in share prices (Tetlock, 2007);

c) **negative information and the future evolution of the share prices**: the emergence of some negative information regarding the evolution of the company allows share price forecasting in the short term. Usually, negative news, but especially news about the fundamentals of companies (low performance, publication of financial statements, strikes etc.) allow investors to make more accurate predictions about the future evolution of the listed company price (Tetlock, Saar-Tsechansky & Macskassy, 2008);

d) **information on the economic climate of a state**: they are more difficult to quantify by all investors, but certain information that appears in the press on the general situation of an economy may influence the future evolution of the share price of some companies. In general, news on the evolution of GDP and the evolution of the unemployment rate are factors that exert a much higher influence than other categories of economic climate news (Birz & Lott, 2011). In addition, some recent studies show that labor market information in general is not just about unemployment, it allows forecasts of stock prices (Stotz, 2018);

e) **inconsistency of public policies and investment decision of companies**: if in a country there are frequent changes in the type of public policies promoted or non-compliance with commitments, they exert a strong influence on investment decisions of private companies. The instability of public policies not only reduces the investments of private companies but can even limit the development of companies that invest in areas of activity with limited possibilities for divestment, or companies that are dependent on public spending to develop. (Gulen & Ion, 2016).

3. DATA

The analysis of the impact of news on the evolution of capital markets involves testing the way in which a capital market evolves in response to the spread of new information in the market. The **NVIX Index - News Volatility Implied Index** proposed by Manela and Moreira, (2017) is an index that measures the uncertainty in the information propagated in the press based on the news published on the front page of the Wall Street Journal between 1890 and 2016. The NVIX index uses several categories of information such as: government, financial intermediaries, natural disasters, capital markets, conflicts and unclassified that allows the forecast of the evolution of the share prices of companies listed in the USA and in the world.

In analysis we use the most important stock indices for each market as follows: *CAC40* - France, *DAX 30* - Germany, *FTSE 100* – United Kingdom and *S&P 500* - United States of America. In the analysis, we will use data from Datastream for the longest period for which there is data for all variables included in the analysis: October 20, 2000 to March 31, 2016.

Since there are small differences in trading hours, in the case of our capital markets we will use the closing price of stock indices in the analysis. In addition, similar to other studies like (Rua & Nunes, 2009) in order to eliminate the potential risk of asynchronous trading 2, we will use monthly data in our analysis. Furthermore, we will use monthly data because NVIX index has data only monthly. For our study, we will use returns of the stock indices expressed in the national currency of a state like other studies like (Rua & Nunes, 2009). We preferred this method as Mink (2015) study highlighted that testing interconnections between capital markets must be performed in the national currency to exclude the influence of the exchange rate on the evolution of capital markets. The alternative method of using the evolution of stock market indices relative to a foreign currency could highlight the influence of exchange rate fluctuations and not the way in which a capital market reacts to exogenous shocks. Table no. 1 presents the descriptive statistics of the data used in the analysis.

Table no. 1 Descriptive statistics of the data used in the analysis

	DE	FR	UK	US	NVIX
Mean	0.001	-0.002	-0.000	0.002	25.996
Median	0.012	0.004	0.008	0.010	26.520
Max	0.141	0.118	0.102	0.104	57.897
Min.	-0.335	-0.305	-0.278	-0.356	13.622
St. dev.	0.069	0.059	0.048	0.051	7.241
Skewness	-1.682	-1.432	-1.544	-2.319	0.749
Kurtosis	8.018	7.108	8.404	15.068	5.608
JB	281.40	193.34	298.756	1288.60	69.76
Prob.	0.000	0.000	0.000	0.000	0.000
Obs.	185	185	185	185	185

Source: Authors calculations

4. METHODOLOGY

The *Continuous Wavelet Transform* – CWT is a method of analysis developed by Torrence & Compo (1998) as a method of testing the degree of synchronization between variables. This method of analysis involves the translation of a series of time series data against some specific mathematical formulas name wavelet, or small „waves” which contain information for both the time and frequency domain $\psi_{\tau,s}(tt)$. This small „waves” are the result of the translation off the wavelet filters, which are then converted into a time variable $\tau\tau$ (the translation parameter) and in a scale parameter s . Each of these two translations are corresponding to a certain frequency used in the analysis as in formula (1) (Rua & Nunes, 2009).

$$\psi_{\tau,s}(tt) = \frac{1}{\sqrt{ss}} \psi \left(\frac{tt - \tau\tau}{ss} \right) \quad (1)$$

Rua & Nunes, (2009) considers that for a certain time series data $x(t)$, $t=1, \dots, N$, the *Continuous Wavelet Transform* – CWT is determined as in the following formula (2):

$$W_{xx}(\tau, ss) = \frac{1}{\sqrt{ss}} \int_{tt=1}^{NN} (tt) \psi \psi^* \frac{tt - \tau}{ss} \quad (2)$$

Where: $W_{xx}(\tau, ss)$ is the continuous wavelet transform, and $xx(tt) \psi \psi^*$ - is the wavelet filter.

The *wavelet coherence analysis* involves testing the interaction between two time series X and Y in a bivariate framework. This involves comparing the general wavelet results of a time series data against another time series, in both time and the frequency domain. In general, (Grindstead, Moore & Jevrejeva, 2004) considers that the wavelet coherence analysis between two series can be calculated as in formula (3):

$$RR_{xxxx}(\tau, ss) = \frac{S^{-1} W_{xxxx}(\tau, ss)^2}{S (S^{-1} |W_{xx}(\tau, ss)|^2) \cdot S^{-1} |W_{xx}(\tau, ss)|^2} \quad (3)$$

Where: $W_{xx}(\tau, ss)$ and $W_{yy}(\tau, ss)$ are the continuous wavelet transforms (CWT) of two different time series, while $S(\cdot)$ is the filtering parameter corresponding to each scale of wavelets. Consistent with the recommendations of Rua & Nunes (2009), we will interpret the results of the wavelet coherence analysis similar to the correlation coefficients in statistics, where high values of the coefficients correspond to key moments in the interaction between two variables. Thus, if we find in the graphical representation distinct areas with high wavelet coherence coefficients, we will interpret this as the result of the interaction of the two time series. In addition, if the areas of interaction are present in the low-frequency areas, we will interpret them as the effect of news-based volatility indices on the evolution of capital markets included in our analysis. Alternatively, if the areas of high interaction between news-based volatility indices and the evolution of capital markets are in high-frequency areas, then we consider that the effect of news and new information is long-term. In addition, we can use the directional arrows in the wavelet coherence analysis to determine which of the two times series is leading or is lagging. By using the *wavelet phase-difference* analysis, we can determine if the two times series are synchronized, or desynchronized, if one series is leading or the other is following, testing the lead and lag phenomenon.

5. EMPIRICAL RESULTS

Our empirical analysis aims to determine how the capital markets of Western, Central and Eastern Europe react to new news appearing in the press. Therefore, we will use the results of the wavelet coherence analysis to test the degree of interaction between news-based volatility and the evolution of developed capital markets.

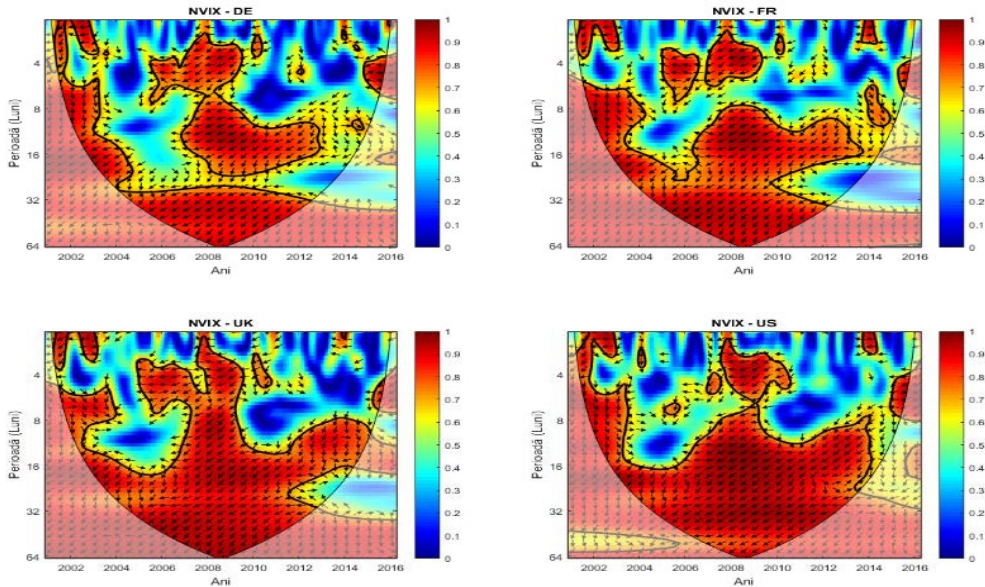


Fig. no. 1 Empirical results Western Europe vs. NVIX

Note: The black borders are the results of a 5% Monte Carlo simulation. The colors used in the analysis vary from blue (reduced power) to red (high power). The Y scale depicts the frequency domain from the shortest (4 months) to the longest (64 months). The X scale is the period of analysis in years. The relationship between the two variables is depicted by the direction of the arrow as it follows: 1. If the arrow is pointing to the right the indices are synchronized; 2. first index is leading if the arrow is upward right; 3) synchronized and the second is leading, right and down; 4) desynchronized and the first index is leading left and down; 5) desynchronized and the second leading left and up; 6) perfectly anticyclical if the arrow is to the left. Source: Authors estimates

The results from *figure no. 1* indicate a strong relationship between the NVIX volatility index and the evolution of developed capital markets between 2000 and 2016. Based upon the directions of the arrows in the graphical representation, we see that most often in the period of analysis, there is an inverse relationship between the evolution of the NVIX index and the evolution of developed capital markets, which indicates an anti-cyclical behavior between the two variables. Moreover, there is evidence that most of the time the NVIX index has the leading role as the arrow is pointing to the left and down.

The leading position and opposite evolution of the two variables is normal because investors react to new information and the share price reflects new information. Thus, when the NVIX index increases due to new information appearing in official media channels, it reduces investor confidence in companies, which leads to a reduction in share prices and a reduction in the profitability of the capital market as a whole. The inverse relationship between uncertainty and market developments is similar to the results obtained by (Manela & Moreira, 2017) based on idiosyncratic volatility tests, and those obtained by (Boudoukh *et al.*, 2019), based on covariance tests. Other studies that have obtained similar results are Tetlock (2007) for the USA, or (Gulen & Ion, 2016) for Canada, USA and Great Britain or (Liu Zang, 2015) in emerging countries.

Secondly, our results reveal that most of the time the relationship is stronger over a time horizon of more than 6-8 months, and for periods longer than 1-2 years news-based

volatility indices significantly influence considerable evolution of capital markets. Our results are like those obtained by (Manela & Moreira, 2017) who observe that over 60% of the volatility of the US capital market can be explained by the NVIX index. Finally, we notice that the synchronization on the short-term (1-4 months) occurred especially after the terrorist attack from 2001, but especially during the recent global financial crisis 2007-2010.

In general, our results indicate that not only developed capital markets react to new information that appear in news media, but the relationship is time and scale dependent. On the short term there is a high degree of synchronicity between news implied volatility indexes and developed capital markets during period of economic and social political crises like terrorists' attacks, global financial crisis and public debt crisis. Meanwhile, there is a high degree of dependency on the long term as we find that the news media has the leading role and the capital market development acts as a follower. This implies, that the effect of news implied volatility indexes is mostly on the long term similarly to the results of (Su *et al.*, 2019a) for emerging capital markets in Asia or the results of (Su *et al.*, 2019b) for the Chinese capital market.

6. CONCLUSIONS

Our analysis tested the influence of news on the evolution of developed capital markets from France, Germany, the United Kingdom and the United States. In order to test the effect of news on the evolution of capital markets between October 2000 and March 2016, we used the wavelet coherence analysis to observe the effect of news in both the short, medium and long term.

The results from our empirical analysis revealed the developed capital markets react faster and for longer periods to new information that appears in news media. Furthermore, the influence of news on the evolution of capital markets is evident on the short term during the financial crisis period, as we find clear evidence of synchronization in the 1-4 months period. Meanwhile for periods longer than 1 year we observe the key role of news in establishing the long-term evolution of developed and emerging capital markets. Therefore, uncertainty depicted in newspaper media can predict the evolution of capital markets. In the short-term we find that there is a high degree of synchronicity between news-implied volatility indexes and turbulent periods like terrorist's attacks, economic crises and general government instability. Meanwhile, there is a high degree of dependency on the long term, as we find that the news media has the leading role and the capital market from developed economies tend to follow the volatility induced by news media.

While the news-implied volatility indexes can be used as a proxy for depicting new information, which appears in the media it can also summarize the general investor's perception overall economy. If the general perception is negative, the capital markets react, therefore if national authorities are able promote a stable economic environment the basis for lower fluctuations off stock exchange could be established. Our empirical results emphasize that investors react to uncertainty in the economic environment in emerging economies and developed economies, therefore ensuring a predictable and stable economic environment should be one the main focuses of policy makers in either types of economies. Uncertainty can influence not only economic growth but also capital market development.

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