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Editors

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Preface

The present volume was supported by a grant of the Romanian National Authority for Scientific Research, CNCS - UEFISCDI, project number PN-II-ID-PCE-2011-3-1054, entitled ”Uncertainty, Complexity and Financial Stability”, within the Romanian-American University Bucharest. It represents a collection of dissertation papers presented by the graduates of the 2013 class of the master program DOFIN (Doctoral School of Finance and Banking) within the Department of Money and Banking of the Academy of Economic Studies, Bucharest.

The papers were coordinated by professors Moisă Altăr, Ciprian Necula, Gabriel Bobeică and Nicolae Covrig. The students, as well as their coordinators, are participants in the above mentioned project.

The theses were defended in front of an international commission, comprising professors Simon Burke from the University of Reading, UK, Peter van der Hoek from Erasmus University, The Netherlands, as well as professors Moisă Altăr, Ciprian Necula and Gabriel Bobeică from the Academy of Economic Studies, Bucharest.

Introduction

The recent financial crisis has brought into discussion a key concept in achieving sustainable growth, largely overlooked or dismissed in times of booming economic activity: financial stability. This apparently simple notion entails a broad and complex system encompassing institutions, markets and infrastructure. Taking into consideration the tight interlinkages between all of the aforementioned components, any individual disturbance can undermine the whole financial system, thus implying the need of a systemic perspective. Before setting out on the difficult task of analyzing and modelling financial stability, we must first define the concept in a rigorous manner. According to the European Central Bank, financial stability is defined as a condition in which the financial system is capable of withstanding shocks and the unravelling of financial disparities. Consequently, upholding financial stability requires policy makers to identify and, if possible, mitigate the main sources of vulnerability and risk.

A series of transformations have been undertaken by the global financial system through the completion and implementation of international reforms in a timely and consistent manner, along the path toward greater financial stability. Following a prolonged period of strong portfolio inflows, emerging markets are facing a transition to more volatile external conditions and higher risk premia. In this context, some countries may need to address financial and macroeconomic vulnerabilities and boost resilience, as they shift to a regime in which financial sector growth is more balanced and sustainable. The euro area is moving toward a more robust and safer financial sector, including a stronger monetary union with a shared agenda for risk mitigation, while concurrently consolidating financial systems and reducing excessive debt levels. The ongoing process of identification and supervision of the main vulnerability channels must have a forward looking approach, as inefficient allocation of funds or deficiencies in risk management can compromise economic stability, even impairing global growth.

The present collection of scientific papers investigate different facets of the financial system, ranging from insightful topics such as macroeconomics or monetary policy to capital markets and credit risk, and provide stimulating and valuable conclusions. Using cutting-edge econometric procedures and examining various sectors of the economy, the researchers contribute to the overarching goal of assessing financial stability in Romania.

About the Authors

Moisă Altăr, Professor Emeritus, Ph.D., Founding Director of the Doctoral School of Finances and Banking (DOFIN) within the Academy of Economic Studies - Bucharest and Senior Researcher at The Romanian-American University, Bucharest. He has published 120 scientific papers and coordinated or participated in 108 research projects in the following fields: Macroeconomic Models, Forecasting Models, Regional Development, Monetary Policy, Fiscal Policy, Technical Progress, Industrial Policy, etc.

Iftekhar Hasan is the E. Gerald Corrigan Chair in International Business and Finance at Fordham University's Schools of Business and co-director of the Center for Research in Contemporary Finance. Professor Hasan serves as the scientific advisor at the Central Bank of Finland. He is the managing editor of the Journal of Financial Stability. Professor Hasan's research interests are in the areas of financial institutions, corporate finance, capital markets and entrepreneurial finance. Professor Hasan has more than 300 publications in print, including 14 books and edited volumes, and more than 175 peer-reviewed articles in finance, economics, accounting and management journals such as JFE, JFQA, JoB, JME, RoF, JFI, JMCB, JCF, FM, JEF, JIMF, JBF, SMJ, RP, CAR, JAAF, and JMIS.

Professor Hasan has presented his research at more than 450 professional meetings and institutions worldwide and has been a consultant for numerous international organizations, including the World Bank, the IMF, the United Nations, the Federal Reserve Bank of Atlanta, the Banque de France and the Italian Deposit Insurance Corporation. Professor Hasan is a research fellow at the Berkley Center of Entrepreneurial Studies at New York University's Stern School of Business and the Center for Financial Studies at RPI. He is a Fulbright Scholar and holds an honorary PhD from the Romanian-American University in Bucharest.

Professor Hasan has held visiting faculty positions at several American and European universities, including the University of Rome, Italy, the University of Strasbourg, France, the University of Carlos III, Madrid, EPFL at Lausanne, Switzerland, the University of Limoges, France, National Taiwan University at Taipei, the University of Romania at Bucharest and NYU's Stern School of Business.

Detecting Intraday Price Shocks and Their Use in Testing the Efficient Market Hypothesis

by Octavian Alexandru

1.1 Introduction

The main purpose of this paper was to identify and study the significant intraday price shocks generated by new information that is being revealed to traders. As it was shown earlier by Friesen, Weller and Dunham (2008), certain properties of these jumps, such as positive autocorrelations, can lead to the appearance of well known "head and shoulders" price patterns, allowing for consistent achievement of returns above the average market returns adjusted to risk.
Before applying the shock-extraction methodology onto real data, we first created a Monte-Carlo simulation in order to achieve a better understanding of the process and reveal a number of details significant enough as to alter the results obtained in the final part of the paper. Although most of the data achieved confirmed our expectations and previous research, we also found some troubling results not mentioned before which required further investigation, the main is-

sue being the decrease of accuracy caused by using lower frequency data, both in the shock's value and in the detection power. The next stage, where the shocks were extracted from real data, confirmed certain parts of current research, while not validating other parts. Since the FX market is very liquid, we did obtain a shock contribution to total volatility of 5% to 10%, as stated in previous articles for certain pairs, but we could not show that the positive shock autocorrelations on the equity markets affect the FX markets also.

Despite using eight different pairs, the results for each of them did lead to the same conclusions. The price jumps density was mostly the same for all eight series and does not change when sampling only the days with highest volatility. We could not find significant positive autocorrelations when analysing pairs separately, but the shocks differ in mean absolute value and volatility from one currency to the other. In the end, by using only the largest 20% of price shocks, we could find a -10% correlation, leading us to think there might be some market overreaction effect caused by most important news. This contradicts the results from the equity markets, being the most important aspect revealed by this paper. In order to add further proof, we also aggregated all available shocks and found a negative autocorrelation statistically different from zero at a 1% level. The main contribution we brought was the analysis of the FX market and a comparative view with the equity market. From our knowledge, the correlations between the price shocks in FX markets were never studied, and the results we obtained are the opposite of the ones from the S&P 100 equity. This invalidates the technical analysis model formerly proposed and provides new opportunities for extracting information from intraday prices.

The other sections of the paper will focus on a short literature review (Section 2), followed by the theoretical methodology of jump extraction and the results obtained in the Monte Carlo simulations (Section 3). Section 4 will provide a few details regarding the empirical data used, the results and their interpretations, including a comparison between the FX and equity markets. Section 5 concludes and provides some ideas for future research.

1.2 Literature Review

It has been known for a long time that the movements on the financial markets, even though assumed usually to be normally distributed, cannot actually be rightfully characterized as having a Gaussian distribution, one of the most common issues being the "heavy tails" in the empirical returns. Progress in this field has been made by Clark (1973) who provided an explanation by using a stochastic volatility model, further developed by Taylor (1982, 1986), latest significant contribution being the one of Barndorff-Nielsen and Shephard (2003).

Shephard (2003) developed a methodology that takes a direct approach at identifying the price jumps from the jump-diffusion process by using high frequency data. Thus, the authors found out that the continuous and jump part contributions can be disentangled by using two indices - the realized variance and the bi-power variation. Later, Tauchen and Zhou (2006) created a finite sample experiment showing that individual jumps can be reliably extracted from intraday data series, confirming by Monte Carlo simulations Shephard's theory. More precisely, they proved that the square root of the difference between realized volatility and bi-power variation (the variance caused only by the continuous component) could estimate consistently the price jump. Dunham and Friesen (2007) took a more practical approach, applied the previously developed theory on the stocks of S&P 100, and found that they account for about 15% of total volatility and 80% of the day's return.

Finally, Friesen, Weller and Dunham (2008) created a model that explains the success of certain trading rules based on price patterns. They also proved the existence of the confirmation bias in the US equity markets, thus showing the possibility of obtaining additional profits from the information incorporated in the price history. Furthermore, they managed to prove that the model they created could make use of the shocks and fit them to a "head and shoulders" pattern, provided the autocorrelation is positive.

1.3 Jump Detection Methodology

1.3.1 Theoretical Framework

In order to successfully identify the price jumps on the financial markets, we have to assume that they are rare and large, taking place no more than once per day. In addition to this, we presume that in the days when they appear, the jumps account for most of that day's return. The process underlying the price movements is considered to be described by:

$$dp_t = \mu dt + \sigma_t dW_t + J_t dq_t \tag{1.1}$$

where $p_t = ln\left(P_t\right)$ is the logarithmic exchange rate at time t, evolving as a continuous jump diffusion process. σ_t is the diffusion at time t and μ is the drift, both of them having the possibility of being stochastic. W_t is a standard Brownian motion. J_t is the logarithmic jump, assumed to be normally distributed during this section and dq_t is a Poisson jump process. Therefore, $\sigma_t dW_t$ shows the movement caused by the diffusion and $J_t dq_t$ shows the change due to price shocks. The intraday returns are calculated from the logarithmic prices:

$$r_{t,j} \equiv p_{t,j} - p_{t,j-1} \tag{1.2}$$

t shows the day that we analyze, while j represents the moment of the day. For example, if we need to find the return of day five, between 00:30 and 00:35, assuming the series has a 5-minutes frequency, we would have:

$$r_{5,7} \equiv p_{5,7} - p_{5,6} \tag{1.3}$$

First specific indicator is the realized volatility, calculated for every day as follows:

$$\mathrm{RV}_t \equiv \sum_{j=1}^{m} r_{t,j}^2 \rightarrow \int_{t-1}^{t} \sigma_s^2 ds + \int_{t-1}^{t} J_s^2 dq_s \tag{1.4}$$

where m is the number of 5-minutes intervals in a trading day. The second indicator is the bi-power variation, also calculated for every day:

$$\mathrm{BV}_t \equiv \frac{\pi}{2} \frac{m}{m-1} \sum_{j=2}^{m} |r_{t,j} r_{t,j-1}| \rightarrow \int_{t-1}^{t} \sigma_s^2 ds \tag{1.5}$$

Theoretically, if there are no jumps, and given a high enough frequency, the realized variance and the bi-power variation should be equal. By aggregating the 2 indicators above we found out an intermediary result, RJ, which is equal to 0 as long as there are no shocks.

$$RJ_t = (RV_t - BV_t) \div RV_t \tag{1.6}$$

The value of the jumps can be computed as follows:

$$\hat{J}_t = sign(r_t) \times \sqrt{(RV_t - BV_t) \times 1_{\left(ZJ_t \geq F_\alpha{}^{-1}\right)}} \tag{1.7}$$

$F_\alpha{}^{-1}$ is the inverse of the standard normal cumulative distribution function, α being the significance level of the z test. $1_{\left(ZJ_t \geq F_\alpha{}^{-1}\right)}$ is the indicator function showing whether there is a significant jump during day t. The normalization