

Volatility in financial markets: Asymmetries, spillovers and trading rules

REALIZADA POR Helena Chuliá Soler.

DIRIGIDA POR Hipòlit Torró Enguix.

PROGRAMA DE DOCTORADO Finanzas Cuantitativas
(Universidades de València, Complutense y del País Vasco).

LUGAR DE DEFENSA Universitat de València.

FECHA DE LECTURA 5 de octubre de 2007.

LUGAR DE CELEBRACIÓN Universidad de Burgos.

FECHA DE LECTURA 20 de septiembre de 2007.

TRIBUNAL Alfonso Novales Cinca (Presidente). Eliseo Navarro Arribas (Secretario).
Martín Martens (Vocal).
Enrique Sentana Iváñez (Vocal).
Juan Ignacio Peña Sánchez de Rivera (Vocal).

SUMMARY

This dissertation focuses on volatility in financial markets, with a special concern for: *i*) volatility transmission between different financial markets and asset categories, both in periods of stability and financial turmoil; *ii*) trading strategies based on these volatility spillovers, and *iii*) the effect of monetary policy on intraday volatility. These varied but related issues are addressed taking into account the phenomenon of asymmetric volatility.

Over the recent decades, focus has shifted from the study of means of asset market returns to return volatilities. The study of financial assets volatility is important to academics, policy makers, and financial market participants for several reasons. First, prediction of financial assets volatility is critical to economic agents because it helps them make rational portfolio risk management decisions. Volatility is critically important to economic agents because it represents a measure of risk exposure in their investments. Furthermore, since the first Basle accord was established in 1996 volatility forecasting is crucial for risk management.

Third, from a theoretical perspective, volatility occupies a central stage in pricing of derivative securities. For example, to price an option we need to know, as a risk measure, the volatility of the underlying asset from now till the option expires. Finally, volatility is important for the economy as a whole. Policy makers often rely on market estimates of volatility as a barometer for the vulnerability of the financial markets and the economy. All these reasons have sparked an enormous interest in modeling the conditional variance and a large number of volatility models have been developed.

The first objective of this dissertation is to increase the understanding of volatility transmission between different financial markets and asset categories. While economists may mainly be concerned about the drivers of shock spillover intensities, from a practitioner's point of view, a better understanding of how markets move together may result in superior portfolio management. Apart from evaluating the direction of the volatility spillovers between different markets and assets, the second objective of this

dissertation consists of testing whether these spillovers are economically significant.

Finally, the third objective is to analyze the effect of an identified news item on returns and volatilities. Concretely we examine the effect of monetary policy decisions. This is an important topic for several reasons. From the perspective of monetary policymakers, having reliable estimates of the reaction of asset prices and volatilities to the policy instrument is a critical step in formulating effective policy decisions. From the perspective of financial market participants, having accurate estimates of the responsiveness of asset prices and volatilities to monetary policy is an important component of making effective investment decisions and formulating appropriate risk management strategies. Moreover, the analysis of the effect of monetary policy on returns and volatility provides insights into the efficiency of the stock market around announcements.

The first chapter is entitled *Firm Size and Volatility Analysis in the Spanish Stock Market*. In this chapter three strongly related questions are studied. First, volatility spillovers between large and small firms in the Spanish stock markets are analyzed. The results clearly show consistent evidence that volatility spillovers between large and small firms are bidirectional. This result adds evidence against the common conclusion that volatility spillovers are unidirectional, from the large firms to the small ones and shows that a piece of news coming from the small firms also can cause volatility in their own returns and in large firm returns. Second, the volatility *feedback* hypothesis explaining the volatility asymmetry feature is investigated. We find that the estimated price of risk is positive and significant. This result indicates that the risk is valued and is consistent with the volatility *feedback* hypothesis. If volatility is priced, an anticipated increase in volatility raises the required return on equity, leading to an immediate stock price decline. Therefore, time-varying risk premiums will be observed. Finally the study uncovers that conditional beta coefficient estimates within the used model are insensitive to sign and size asymmetries in unexpected shock returns and that the unconditional beta estimate has a significant specification error. Therefore, for a dynamic portfolio management it is necessary to use asymmetric conditional

models in order to avoid specification errors on estimating the beta coefficients.

The second chapter is entitled *The Effects of September 11 on Volatility Transmission*. This chapter contributes to the discussion on volatility transmission between the US and Spain. More specifically we assess whether volatility transmission patterns between the US and Spanish stock markets have changed after September 11, 2001. Most of the studies that examine the effects of the attacks of September 11 on financial markets focus on the economy as a whole or in different concrete aspects of the economy but as far as we know, September 11 has not yet been included in any paper analyzing volatility transmission in international markets. We use 16:00-to-16:00 synchronous stock market series to analyze volatility spillover between Spain and U.S which reduce the non-synchronous trading problem. We also present a complementary analysis, the Asymmetric Volatility Impulse Response Functions (AVIRF), which distinguishes effects coming from a positive shock from those coming from a negative shock. The results confirm that there exist own asymmetric volatility effects in both markets and that volatility transmission from US to Spain has increased after September 11.

The third chapter is entitled *The Economic Value of Volatility Transmission between the Stock and Bond Markets*. The focus of this chapter deals with the issue of volatility transmission between stocks and bonds in the European market and whether we can put forward a profitable dynamic trading strategy between both assets. While the paper focuses on the stock and bond markets our trading strategy can be applied to other financial markets or assets such as stocks belonging to different sectors or different countries.

We find that volatility spillovers take place in both directions: a piece of news coming from the stock market affect the bond market volatility and the other way round, stock market variance is responsive to bond market return shocks. However, while conditional stock variance responds asymmetrically to both bond and stock return shocks, conditional bond variance responds asymmetrically to stock return shocks but symmetrically to bond return shocks. Next,

we try to exploit volatility transmission between stocks and bonds by using a trading rule with an innovative approach that distinguishes between bad volatility pieces of news and good volatility pieces of news. This strategy is based on the inverse relationship existing between expected return and volatility. Our trading rule confirms that volatility spillovers are economically significant since it offers profitable returns after transaction costs. Moreover, there is some evidence that switching decisions based on volatility pieces of news coming from the bond market seem to be more profitable than those based on volatility pieces of news coming from the stock market.

The fourth chapter is entitled *The Effects of Fed Funds Target Rate Changes on S&P100 Stock Returns and Volatilities*. In this paper we examine the effects of the FOMC (Federal Open Market Committee) decisions on the Federal Funds target rate on intraday returns and volatilities of the constituents of the S&P100 index. This analysis provides insights into the efficiency of the stock market around announcements and whether intraday market participants respond differently to bad and good news.

What is new with this paper is the use of intraday data of the constituents of the S&P100 index. This allows us to investigate whether the response to such announcements is truly market-wide, or whether they mainly affect the price and volatility of certain stocks in particular industries. Moreover, the use of intraday data allows us to better isolate the response of asset prices and volatilities to monetary policy announcements, since we can be almost certain that no other economic news was released within such a brief interval of time. The results overwhelmingly confirm that surprises (unexpected rate changes) matter, and that the actual rate changes do not. Whereas, we see differences between positive and negative surprises, we do not find significant asymmetries in the effects of surprises depending on whether the target rate is increased or decreased or left unchanged. Finally, the results for both the industry returns and industry volatilities show considerable differences in the effects of target rate surprises across sectors. As expected, Financials shows the strongest response showing that the target rate surprises are relatively more important for this industry.