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Volatility returns with vengeance: Financial markets vs. commodities

Sofiane Aboura[a], Julien Chevallier[b,*]

[a] DRM Finance, Université Paris Dauphine, Place du Maréchal de Lattre de Tassigny, 75775 Paris Cedex 16, France
[b] IPAG Business School (IPAG Lab), 184 Boulevard Saint-Germain, 75006 Paris, France

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ABSTRACT

To assess how financial markets and commodities are inter-related, this paper introduces a 'volatility surprise' component into the asymmetric DCC with one exogenous variable (ADCCX) framework. We develop an econometric model in which returns and volatility allow to influence pairs of assets, and derive several case studies linking commodities to stocks, bonds and currencies from 1983 to 2013. The innovative feature of our model is that these volatility spillovers are modeled consistently within the correlation dynamics of the ADCCX. We find evidence that return and volatility spillovers do exist between commodity and financial markets and that in turn, their relative impact on each other is very substantial.

1. Introduction

Understanding the origins of volatility has long been a topic of considerable interest to both policy makers and market practitioners. Policy makers are mainly interested in the main (possibly real) determinants of volatility, and in its spillover effects on real activity. Market practitioners – such as investment bankers – are mainly interested in the direct effects time-varying volatility exerts on the

* Corresponding author. Tel.: +33 01 49 40 73 86; fax: +33 01 49 40 72 55.
E-mail addresses: sofiane.aboura@dauphine.fr (S. Aboura), julien.chevallier04@univ-paris8.fr (J. Chevallier).

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pricing and hedging of plain vanilla options and more exotic derivatives. In both cases, forecasting volatility constitutes a formidable challenge, but also a fundamental instrument to manage risks.

Since the financial crisis of 2008, the topic of international volatility transmission across markets has once more attracted a considerable attention. Recent studies analyze the extent of cross-market linkages over different asset classes: financial assets (Straetmans and Candelon, 2013; Wang et al., 2013), and commodities (Chng, 2009; Chan et al., 2011). Cross-sectional effects amongst financial and nonfinancial assets constitute a central topic in asset pricing. However, we know little about how markets interact. How do shocks go from one market to others? Are these shocks able to contaminate assets belonging to other asset classes? Do commodities have a significant influence on financial markets? Whereas commodity markets price different risk factors from a linear asset pricing perspective, extreme events can still trigger contagion effects across markets.[1]

Spillovers actually encompass two kinds of phenomena: (i) directional shocks as documented recently by Diebold and Yilmaz (2012) and (ii) a contagion effect traditionally defined by Forbes and Rigobon (2002) as a significant increase in cross-market linkages after a shock. Regarding cross-market dependencies, the key point in spillover analyses is the equity-to-commodity relationship. Indeed, following the contribution by Gorton and Rouwenhorst (2005), investors have increasingly started to trust the diversification effect that commodities could bring to their portfolio.

A few spillover analyses have been devoted to the commodity-equity linkage. Most of the literature is based on dynamic correlation models that have been proposed following Engle's (2002) DCC model and its extensions. These approaches aim at measuring how correlations across markets can move together – which is usually regarded as a measure of contagion.

Literature on spillover analyses include, for example, Karolyi and Stulz (1996), Longin and Solnik (2001), Ang and Chen (2002) and Forbes and Rigobon (2002). Chong and Miffre (2010) find that the correlation between standard assets and commodities is lower during periods of crisis, i.e. when diversification effects are the most sought for. Silvennoinen and Thorp (2010) find the exact opposite conclusion. During turbulent periods, these correlations are rising. Such disagreement may come from differences in terms of methodologies, or in terms of the periods covered in each dataset. Buyukshahin et al. (2010) find that such correlation increases after 2008, casting some doubt around the commodity diversification effect. Dasklaki and Skiadopoulos (2011), Bichetti and Maystre (2012) and Delatte and Lopez (2013) find evidence consistent with these conclusions.

Other types of econometric methodologies have been designed to capture cross-market linkages. For instance, copulas – a more general dependence structure than the underlying Gaussian model behind the dynamic correlation models – went through an increasing attention, as presented in Patton (2006), Jondeau and Rockinger (2006) and Rodriguez (2007) for standard assets; and in Reboredo (2011) in the case of commodities. Nevertheless, beyond their ability to measure tail dependence – i.e. joint extreme events – turning them into a dynamic measure of dependence turned out to be difficult.

Multivariate Markov Switching models also encompass in a certain way the measurement of cross time series dependence, as presented in Khalifa et al. (2012). Their ability to produce switches between two types of dependence structures led to interesting findings in financial markets (Ielpo, 2012). Their numerical complexity when increasing the number of underlying variables is, however, a massive drag to their use to measure cross-market dynamics. This computational burden to estimate sophisticated specifications of such models in the case of cross-commodity measurement limitates their use.

Diebold and Yilmaz (2012) have presented a new approach to measure cross-asset volatility spillovers through the historical cross-series mean reversion parameters. Their approach has been used in Yilmaz (2010), Kocenda et al. (2011) and da Fonseca and Gottschalk (2012), for example. The apparent simplicity and the efficiency of the estimates obtained turn this approach into a very promising one.

In this article, we advance a methodological contribution related to the first strand of literature, e.g. dynamic correlations models. Previous studies have mostly examined the spillovers in multivariate GARCH-type models (Engle et al., 1990; Hassan and Malik, 2007; Cai et al., 2008). In contrast with

[1] Whereas 'contagion' is defined later in the paper, the study of *returns* 'co-movements' begins with Grubel (1968), who explains first the benefits from international diversification.