North American Journal of Economics and Finance 29 (2014) 336–348

Contents lists available at ScienceDirect

North American Journal of Economics and Finance

Nonlinear causality testing with stepwise multivariate filtering: Evidence from stock and currency markets☆

Stelios Bekiros[a,b,c,*]

[a] IPAG Lab, IPAG Business School
[b] European University Institute (EUI)
[c] Athens University of Economics and Business (AUEB)

ARTICLE INFO

Keywords:
Nonlinear filtering
Multivariate GARCH
Spillovers

JEL classification:
C14
C51
F31

ABSTRACT

We examine the spillovers of the US subprime crisis to Asian and European economies and in particular to what extent currency and stock markets have been affected by the crisis. Linear and nonlinear dependencies are detected after pairwise and system-wise causality analysis. A new stepwise multivariate filtering approach is implemented after controlling for conditional heteroskedasticity in the raw data and in VAR/VECM residuals using multivariate GARCH models. Significant nonlinear causal linkages persisted even after the application of GARCH-BEKK, CCC-GARCH and DCC-GARCH modelling. This indicates that volatility effects might partly induce nonlinear causality. Perhaps new short-term asset-pricing models could be developed to explain this stylized fact. These results might also have important implications for hedging, trading strategies and financial market regulation.

☆ I would like to thank the Guest Editors, Shawkat Hammoudeh and Duc Khuong Nguyen, the Editor, Hamid Beladi, and a referee for thoughtful comments and suggestions. This research is supported by the Marie Curie Fellowship (FP7-PEOPLE-2011-CIG, No 303854) under the 7th European Community Framework Programme. The usual disclaimers apply.

* Correspondence to: IPAG Business School, 184 Boulevard Saint-Germain, 75006 Paris, France. Tel.: +33 01 53 63 36 00; fax: +33 01 45 44 40 46; Department of Economics, Via della Piazzuola; 43, I-50133, Florence, Italy. Tel.: +39 055 4685 916; fax: +39 055 4685 902; Department of Finance, 76 Patission str, GR104 34, Athens. Tel.: +30 210 8203453; fax: +30 210 8203453.
E-mail addresses: stelios.bekiros@eui.eu, bekiros@aueb.gr

http://dx.doi.org/10.1016/j.najef.2014.06.005
1062-9408/

1. Introduction

During the Great Moderation period and in particular during the 1990s, currency and stock markets have grown more similar. This led to lower exchange rate volatility and caused asymmetry in reactions towards macroeconomic developments to significantly decrease.[1] The result of the gradual abolition of capital controls and trade barriers provided the foundation for liberalized and deregulated currency and equity markets. The deregulation of capital movements lead to a systematic interrelation of the major financial markets. This dependence indicated a growing similarity in reactions towards macroeconomic policies or financial crises. Evidence from the empirical literature exists on the spillovers of US currency volatility across other foreign exchange markets and on "stylized facts" like leptokurtosis and volatility clustering both in stock and FX markets. The currency studies focus on the investigation of the stochastic behaviour of the USD via the implementation of ARCH models by Engle (1982) (Engle & Bollerslev, 1986; Boothe & Glassman, 1987; Hsieh, 1989; Baillie & Bollerslev, 1989, 1990; Engle, Ito, & Lin, 1990). Hogan and Sharpe (1984) and Ito and Roley (1987) were among the first who examined the transmission mechanism as well as price information efficiency in currency markets during the 1980s.

The direction and nature of causality in currency and equity markets, i.e. linear or nonlinear is also a matter for investigation. Considering the FX markets, ever since the seminal work of Meese and Rogoff (1983) in which they examined the failure of some linear exchange rate models, several more recent studies have provided further evidence of the empirical failure of linear models. Nonlinear extensions include the concept of bubbles with self-fulfilling expectations (Blanchard & Watson, 1982), micro-founded models of trading behaviour (Krugman & Miller, 1993), nonlinear monetary policies (Flood & Isard, 1989) or technical trading (Black, 1986; De Long, Shleifer, Summers, & Waldmann, 1990). Empirical studies have mainly tested for nonlinearities due to target zones, and have failed to support such nonlinearities (Lindberg & Soderlind, 1994). Still it remains an open question whether other types of nonlinear interdependencies across FX markets exist. Similarly, regarding stock markets the empirical evidence is diverse depending on the data, methodology and theoretical models used. Previous works by Arshanapalli and Doukas (1993) and Hamao et al. (1990) showed that international stock markets are strongly integrated. On the contrary, Roca (1999) and Smyth and Nandha (2003) showed that global markets are weakly interlinked. However, the majority of studies indicate that the US market leads other developed markets (King and Wadhwani, 1990). In particular, Lee et al. (2004) investigate the linkages between the daily returns and volatility of the NASDAQ and Asian markets using EGRARCH and VAR-based methodology, and found strong evidence of volatility spillovers from the USA to Asia. Bennett and Kelleher (1988), Hamao et al. (1990) and Susmel and Engle (1990) showed that US equity markets appear to cause the other countries and that lagged 2nd moment (volatility) spillovers are found between the major markets. Also, global contagion was observed during the October 1987 crash in New York, according to King and Wadhwasi (1990). Dornau (1998) and Peiró et al. (1998) using linear causality tests, analyzed the transmission mechanism among the US, Japanese and German stock markets, while Baur and Jung (2006) examined the decoupling between the US and German stock markets. The latter found that both markets have a contemporaneous effect on each other, but that there are no lagged spillovers from previous days. In recent studies, Lee, Huang, and Yin (2013) illustrated various patterns of lead–lag relationships in stock and bond markets and Lee and Chang (2013) showed that there is a significantly positive relationship between spillovers of currency carry trade returns and US stock market returns.

It seems that inter-causal links within currency and stock markets have important implications for hedging, trading strategies and financial market regulations. This study contributes to the literature on market interdependencies by focusing on US, Asian and European stock markets as well on the most liquid currency markets denoted relative to United States dollar (USD), namely Euro (EUR), Great Britain Pound (GBP) and Japanese Yen (JPY). It also examines the spillover of the US subprime crisis

[1] According to Stock and Watson (2003) the Great Moderation period initiated around the mid-1980s and lasted until the beginning of the 2000s. During that period, the growth variance of the G7 countries was considerably lower, from 50% to 80% in comparison to the pre- and the post –Great Moderation period.