Full length Article

Stability of cross-market bivariate return distributions during financial turbulence

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A B S T R A C T

The paper examines the stability of the bivariate stock return distributions across the G5 and five emerging markets in times of financial crisis using copula models. We find that the volatility dynamics as well as the dependency structures appear to be both country- and period-specific. Neither the bivariate distributions nor the associated parameters appear to be stable over time. It implies that the usefulness of the copula techniques may be limited particularly in times of financial turbulence. Our results strike a note of caution for the practitioners and policy makers in dealing with the phenomenon of financialization which draws much strength from the quantitative financial models.

1. Introduction

The Global Financial Crisis (GFC) of 2008–2009 has brought to attention the perils of *financialization*, which refers to the growing dominance of financial instruments and markets over the traditional industrial and agricultural economies, and is connected with the concomitant development of cyberspace, the global deregulation of financial markets, and the rise of shareholder governance (Lagoarde-Segot, 2017).[1] Palley (2007) argues that principal impacts of financialization are to (i) elevate the significance of the financial sector relative to the real sector; (ii) transfer income from the real sector to the financial sector; and (iii) increase income inequality and contribute to wage stagnation. Additionally, financialization may render the economy prone to risk of debt-deflation and prolonged recession. Aalbers et al. (2015) present a case study of the financialization of both housing and the state in the Netherlands documenting its negative consequences. Cloke (2010, 2013) suggests that the global financial crisis "represents a distinctly new form of actor-network capitalism, originating in the hybrid financial innovations since the 1970s, the explosive growth in cyber-space potential during the 1990s and the subsuming of the State by finance that accompanied these two processes." The author proposes that the evolution of ultra-capital (capital beyond capital) from within the global financial services sector, need to be considered for a proper understanding the recurrent financial crisis. Vitali et al. (2011) suggest that the structure of the control network of transnational corporations creates a small tightly-knit core of financial institutions, an economic "super-entity" which affects global market competition and financial stability.

The acceptance and rationalization of the reliance on financial markets and products is to a large extent anchored in mathematical

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  [1] According to Palley (2007) financialization is a process whereby financial markets, financial institutions and financial elites gain greater influence over economic policy and economic outcomes. According to Aalbers (2015) the financialization literature seeks to conjoin real-world processes and practices that are otherwise treated as discrete entities; how the financialization of the global economy is tied to the financialization of the state, economic sectors, individual firms, and daily life. Gupta (2015) provides a brief review of the literature on "financialization" and the causes for the emergence of this phenomenon. For a more detailed treatment, see Epstein (2005).

models and the theoretical framework assuming economic rationality. Walter (2016) argues that management tools and beliefs of financial practices are embedded in the structural discourse he terms as the "*financial logos*." He hypothesizes that this "discourse contains a specific representation of risk mathematically modelled by probability measures." Using the concept of *performativity*, he argues that mathematical modelling plays a concrete role in the framing of financial decisions, and makes contributions to financial practices in the epistemologically and sociologically sense.[2] Dupré and Perluss (2016) point out that historically rules and regulations have often taken into consideration the performativity of risk insurance so as to limit the range of insured risks and thus avoid the realization of the claims through embezzlement or kindred corruption. Today, the finance profession takes "risk quantification as an incontrovertible given." Quantifying risk has become a key feature in modern finance, "a dogma," ignoring the distinction between risk and uncertainty.

The use of mathematical models to reduce the complexity of the financial markets is certainly alluring. However, quantitative models have been shown to poorly predict financial markets; inadequacies of the quantitative models in assessing financial risk arising from extreme events are well discussed; see for example, Salmon (2009), Bernstein (1996) and Taleb (2007). The less than satisfactory performance of the quantitative models has been attributed to the difficulties in correctly estimating the parameters of the models, and much research has been devoted to more accurately estimating data driven parameters; for example, Carey et al., 2014Carey, Gath and Hayes (2014) develop a generalized smoothing approach to modeling financial dynamics. However, it is also important to examine the nature and structure of the return distributions underlying the quantitative finance models and how these are affected in times of turmoil.

An important genre of quantitative risk models deals with the interdependence of different financial markets that can lead to contagion and the spillover of economic shocks across markets. The Global Financial Crisis period provides us an opportunity to investigate the bi-variate distributions used to model the co-dependence of stock markets and the stability of their structure during times of severe financial turbulence. The GFC had extreme and far-reaching effects on the financial markets across nations. Stock market volatility increased several fold throughout the crisis, all assets experiencing extreme returns. Exceptionally large swings in the stock prices were experienced with a frequency which had never been observed previously.

The objective of this study is to examine how the nature and characteristics of cross-market return distributions were impacted during the financial turmoil. This objective is pursued by first examining the effect of the Global Financial Crisis on the structure of volatility dynamics in selected emerging and G5 equity markets (see data section below). We then examine the degree and structure of financial market inter-dependence among the emerging and the G5 economies using the copula framework. Next, we address the question of the stability of the bivariate joint-distributions. Finally, we conclude by drawing implications for the applied usage of quantitative models as well as with respect to a broader perspective on financialization.

1.1. Contagion Studies

The spillover of economic shocks across financial markets has been a subject of considerable research and risk modelling. In the past, monetary crisis originating in the developing markets, e.g., the Asian Flu, the Tequila Crisis or the Russian Virus, were considered as infectious, and prompted gigantic bailouts by the global organizations to stem contagion. Among the academic studies, the earliest papers is one by Morgenstern (1959), who inspected the spill-over effects of 23 stock market panics on foreign markets. Later econometric research concentrated on correlation analysis utilizing GARCH-type models to inspect if equity market co-movements become stronger or weaker throughout crashes as compared with non-crash periods. These include among others Lin et al. (1994) and Susmel and Engle (1994). More recently, research has focused on the spillovers and contagion from the Global Financial Crisis. There is well established empirical evidence of increase in inter-market correlations, spillovers and contagion. However, not much scholarship has been devoted to the study of its impact on the nature and characteristics of bivariate distributions underlying the risk models.

Several of the contagion studies while documenting an increase in correlations during times of crisis also show the magnitude of contagion to be different for each country pair. Gilenko and Fedorova (2014) examine spillover effects for the BRIC stock markets during the crisis period and find some evidence for the 'decoupling' phenomenon. Luchtenberg and Vu (2015) show that both economic fundamentals such as trade structure, interest rates, inflation rates, industrial production, regional effects, and investors' risk aversion contribute to international contagion. Jin and An (2016) show that during the 2007–2009 GFC, the degree of stock market reactions to shocks originating in the US differs from one BRIC market to another, depending on the level of integration with the international economy. Rejeb and Arfaoui (2016) in a study of volatility spillovers over a longer period 1993–2010, find that volatility transmission between the emerging and the developed stock markets is closely associated with geographical proximity as well as with crisis periods, observing that the interdependence increases during bullish markets while decreases during bearish markets. Rothonis et al. (2016) find that cultural proximity can intensify volatility linkages across inter-national equity markets; their cultural distance measure is inversely related to the strength in return volatility linkages between country pairs. These linkages are intensified when there is a wider common investor base between two markets, with greater bilateral portfolio investments and the degree of openness in terms of their foreign exchange trading activity. Al Nasser and Hajilee (2016) document the existence of short-run integration among the emerging and the developed markets. However, the long-run relationship of all emerging countries is significant only with the Germany stock market. Yavas and Dedi (2016) study European exchange traded fund (ETF) and find existence of significant co-movement of returns as well as volatility spillovers. Espinosa-Torres et al. (2016) in a study of how Latin

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[2] MacKenzie et al. (2008) examine whether economics is performative – whether, in some cases, economics actually produces the phenomena it analyzes.