Examining the efficiency and interdependence of US credit and stock markets through MF-DFA and MF-DXA approaches

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HIGHLIGHTS

- Relative efficiency of 11 industry-level US credit and stock markets is examined through MF-DFA.
- Mutual interdependence between CDS-equity market pairs is investigated using MF-DXA.
- Both credit and stock markets exhibit multifractal behavior.
- Industry-level credit markets are relatively more inefficient compared to their equity counterparts except the Banks and Financial sectors.
- Materials has the highest dependence with the other credit market industries.

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ABSTRACT

This study examines the power law properties of 11 US credit and stock markets at the industry level. We use multifractal detrended fluctuation analysis (MF-DFA) and multifractal detrended cross-correlation analysis (MF-DXA) to first investigate the relative efficiency of credit and stock markets and then evaluate the mutual interdependence between CDS-equity market pairs. The scaling exponents of the MF-DFA approach suggest that CDS markets are relatively more inefficient than their equity counterparts. However, Banks and Financial credit markets are relatively more efficient. Basic Materials (both CDS and equity indices) is the most inefficient sector of the US economy. The cross-correlation exponents obtained through MF-DXA also suggest that the relationship of the CDS and equity sectors within and across markets is multifractal for all pairs. Within the CDS market, Basic Materials is the most dependent sector, whereas equity market sectors can be divided into two distinct groups based on interdependence. The pair-wise dependence between Basic Materials sector CDSs and the equity index is also the highest. The degree of cross-correlation shows that the sectoral pairs of CDS

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1. Introduction

The analysis of time series dependence is a key research area in finance, economics and physics. Time series dependence in the financial markets, whether temporal or sectional, may lead to the prediction of a time series and the possibility of violating the efficient markets assumption. The efficient markets hypothesis (EMH) is of great importance in financial literature for understanding and promoting the quality of financial markets. A market is qualified weak-form efficient if all available and relevant information (historical price information) is immediately and fully reflected in the asset prices [1]. Thus, the validity of the EMH implies that market price forecasts are impossible to make because there are no accurate patterns to asset prices and that no investor can take advantage of the available information to make abnormal profits through arbitrage. However, in financial literature, studying the EMH remains the key to identifying possible gains.

The lack of consensus on the theoretical background and the inconsistency of the empirical evidence constitute additional reasons to study financial market dynamics. Recent literature supports the stock market efficiency premise (see [8–18]; among others), while other studies reject the EMH (see [19–24]; among others).

Despite many studies that research the efficiency of the stock markets, there has been less focus on the credit default swap (CDS, hereafter) market, which has experienced phenomenal growth. In fact, the CDS market began growing in the late 1990s; by the end of 1997, its size was approximately $180 billion in nominal terms. The notional amount doubled each year from 2004 to 2007, achieving a peak of $58 trillion by the end of 2007; this nearly surpassed foreign exchange derivatives as the second largest segment in the global OTC derivatives market [25]. This remarkable growth in the CDS market has made it an active venue for credit risk transfers and has made it one of the most important financial innovations in recent times. It is worth noting that CDSs were blamed for exacerbating the 2008 financial crisis. The notional amount of outstanding credit derivatives contracts decreased from $16 trillion at December-end 2014 to $15 trillion at June-end 2015; this represented only a quarter of the market’s 2007 year-end peak of $58 trillion [25]. Concurrently, CDSs have been subjected to intense policy debates that include discussions of their role in the recent financial crisis [26], their effect on the debtor and creditor relation [27,28] and the cost of capital, credit risk and financial choices of firms [29,30].

A growing body of empirical literature examined CDS market efficiency. Norden and Weber [31] and Zhang [32] investigated the impact of adverse credit events and credit rating announcements on the informational efficiency of CDS and stock markets. Hull et al. [33] analyzed the relationship between bond yields, CDS spreads and credit rating announcements. Acharya and Johnson [34] examine the effects of insider trading on credit derivatives. Forte and Pena [35] analyze the informational content of stocks, bonds and CDS spreads. Ismailescu and Kazemi [36] document the reaction of emerging market CDS spreads to sovereign credit rating changes. Jenkins et al., [37] study the informational efficiency of the CDS market using post-earnings announcement returns. Schweikhard and Tsesmelidakis [38] show how the CDS and equity markets are impacted by government interventions. In a recent study, Zhang and Zhang [39] analyze the impact of earnings surprises on the information efficiency of the US CDS market. However, these studies have mainly focused on country-level credit markets and have examined the impact of different events on credit market efficiency.

Many factors, including higher trading costs, bad quality of information systems, disintermediation, and lack of competition due to investment barriers can cause the information inefficiency in the financial markets [18]. Other stylized facts that may contribute to the rejection of an asset return’s normality include the leverage effect (the negative relation between volatility and profitability), volatility clustering, the existence of asymmetries in gains and losses (loss movements are more pronounced) and autocorrelation in return variance. These factors result in serial dependence, both linear and nonlinear, and thus require focus to identify the possibility of autocorrelation in a financial time series.

The most important development to identify long-range dependence behavior and its implications for financial market efficiency is the adoption of Detrended Fluctuation Analysis (DFA) proposed by Peng et al., [40], which was first applied in 1995.
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