Predictability and co-movement relationships between conventional and Islamic stock market indexes: A multiscale exploration using wavelets

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H I G H L I G H T S

- The relationship between conventional and Islamic stock markets is examined using MRA.
- The aim is to locate similarities and differences across different time-scales.
- The analysis revealed unusual patterns especially occurring at crises periods.
- A bidirectional causality is found, thus opening new prospects for joint forecasting.

A R T I C L E   I N F O

A B S T R A C T

This paper investigates the dynamical relationship between conventional and Islamic stock markets using the wavelet-assisted cross-spectral, cross-correlation and causality analyses. Relying on bivariate time series from emerging and developed markets, the aim is to find and recognize local microscopic signs of convergence or divergence. The data set covers a period of exceptional instability in the financial system that was accompanied by a significant slump in the global economic environment. The empirical results demonstrate an obvious strong dependence between conventional and Islamic indexes at low-frequency, while the dependence becomes rather instable in the finest frequencies across different investment time horizons. The relationship also took a special different form in the crisis period compared to relatively calm periods. In developed markets, indexes were the most correlated over many periods and at many frequencies, while the relationship in emerging markets tended to be less manifest, especially for short-term horizons, offering investors different investment alternatives and portfolio diversification opportunities. The pre- and post-crisis causality investigations at the end of the study suggested a bidirectional relationship in most cases, thereby offering further perspectives on multivariate forecasting.

1. Introduction

The recent Global Financial Crisis (GFC), which was sparked by the U.S. subprime market and banking defaults, caused severe damage to different international stock markets and global economic growth. During this crisis, both market participants and portfolio managers rushed into buying safe assets, including gold (Baur and Lucey [1]). Concurrently,

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Islamic finance assets (including Islamic stocks and Sukuk[1]) have emerged as alternative investments in economic and financial turmoil episodes. Islamic finance is guided by the principles of Islamic law, which prohibits interest, excessive risk-taking, and gambling, and promotes risk-sharing instead of risk-shifting. Recently, Islamic securities markets have been developed and have gained popularity in international financial markets. One area of Islamic finance that has attracted many investors is the development of Islamic equity indexes designed to track the performance of publicly traded Sharia[2] -compliant companies. The Islamic indexes are exposed to rigorous screenings for business activities and financial ratios and purification of dividends. Most major global banks and investment firms, both in Islamic and in non-Islamic countries, provide investors with the opportunity to invest in compliance with Sharia principles [2].

Assessing the co-movement between asset returns is one of the most fundamental aspects of contemporary finance. In international finance, the existence of low cross-correlations between global equity markets forms the basis of risk reduction through international diversification. The risk of holding a portfolio comprised of a range of international equity markets has long been shown to be lower than the risk of the component assets [3]. This study contributes to the literature by addressing the following unanswered questions: Do co-movements exist between Islamic and conventional indexes? Are cross-correlations significant and how can their structure change across the time–frequency plane? Do divergences exist between conventional and Islamic indices? What are the implications of an eventual crisis on the joint relationship? Does the interconnection between global, emerging and developed markets significantly vary across different investment horizons? Can Islamic indexes provide international investors with more alternatives for hedging and diversification purposes? Responding to these questions certainly requires precise and serious study. However, although there is growing interest in exploring the interactive links between conventional and Islamic markets, the recent literature and most studies in this context lack consistent statistical tools to better examine this relationship and thereby answer the above questions. Standard time series econometric methods have often been employed for modeling. These models usually consider the frequency and time components separately, which can seriously reduce their performance.

During the past several years, wavelet-based statistical analysis has become a powerful alternative to conventional statistical methods when many standard assumptions are not met [4–7]. The wavelet methods are model-free approaches offering the opportunity to analyze non-stationary data in both time and frequency spaces. These properties make them very powerful in comparison to other methods that rely on parameters as well as the estimation method. The introduction of wavelets in the above-mentioned context can help us to uncover interactions that are hard to see using any other old-fashioned econometric method, and which would otherwise stay hidden [8,9]. In particular, the wavelet cross analysis is a technique that has been often used in many fields with inherently stochastic natures and where key variables are handled in pairs. Applications include problems in econophysics as well as statistical physics and many of its branches. The main purpose of the technique is to clarify the conjoint properties of the studied systems, in terms of physical laws governing the dynamic motion. In economics and finance, wavelets have often been used for univariate data, where the most well-known references are [5,10]. However, their exploitation for multivariate datasets, especially for vectors of time series, has been relatively limited [11–13]. In this context, the overall trend has been to use extensions of the well-known cross-spectral and cross-correlation analyses, reinforcing them by wavelets techniques and thus allowing multiscale exploration [3,14–16].

The paper proposes a wavelet-based bivariate time series methodology to investigate co-evolution and predictability relationships between conventional and Islamic stock markets. In particular, we use a suite of wavelet-assisted statistical tools to locate periods of convergence or divergence in both time and frequency spaces. The main motivation of this study arises from the perception that Islamic financial instruments may provide a cushion against increasing risk and instability in conventional financial markets, particularly in the wake of the recent global financial crises. Usage of wavelets allows us to disaggregate cross-correlation measures into several investment horizons. Moreover, there is a strong motivation for many investors of different cultures, religions and lifestyles to make faith-based investments. The principal intention of this study is to present a clearer view of the multi-scaled co-evolution of conventional and Islamic stock markets, analyzed against the backdrop of different market conditions. Another distinctiveness of this analysis is that it is conducted under the circumstances of a crisis, where detecting unusual patterns must be part of any eventual conjoint modeling project.

The methodology first consists of adaptively diagnosing couples of times series using continuous wavelet power spectra and coherence. These tools allow us to give an overview of the dynamics of the relationship between couples of time series, allowing us to localize and zoom in on particular patterns. The Maximal Overlap Discrete Wavelet Transform (MODWT) -based cross-correlation function is used in a second stage as a post-processing tool used to reinvestigate particular areas in order to give more explicitness to the analysis. Finally, we use a wavelet-based causality test to discuss the transmission direction of the cross-correlation before and after the crisis. Using the daily data available from global, developed and emerging market indices, our empirical results show the following: (a) a co-movement and cross-correlation among conventional and Islamic indices; (b) that periods of sharp recession are accompanied by changes in the co-movement dynamics; (c) the dynamics can take different patterns across periods and regions; and (d) the wavelet-based causality tests validate a bidirectional relationship for most pairs before and after the crisis.

The structure of the paper is as follows. A summary of research on the relationship between conventional and Islamic markets is put forth in Section 2. Sections 3 and 4 provide background on the wavelet multi-scaled analysis with a focus on

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[1] The word Sukuk is the plural form of Sakk which mean Islamic bond. Sukuk refer to certificates that demonstrate entitlement to a particular property (ies).

[2] Sharia are the principles of the Islamic law.