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Dynamics of financial markets and transaction costs: A graph-based study

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ABSTRACT

In financial markets, trading patterns influence the behaviour of arbitrage, surveillance, risk management and pricing returns. The analysis of these patterns is important for defining policies in financial regulation as well as portfolios of international assets. Using financialization as a conceptual framework to understand the current trading patterns of financial markets, this work employs a market graph model for studying the stock indexes of geographically separated financial markets. By using an edge creation condition based on a transaction cost threshold, the resulting market graph features a strong connectivity, some traces of a power law in the degree distribution and an intensive presence of cliques. Furthermore, an inverse relation between transaction costs and maximal clique size is noticed. The market graph model also indicates that infrastructure, sustainability and commodity indexes from APEC, EU and NAFTA affect the behaviour of markets. As a result, the graph approach shows a consistent set of outcomes that mostly explain the financialization dynamics of markets.

1. Introduction

The increasing complexity of the financial networks requires a conceptual framework that combines aspects of information technologies, deregulation of economies and the "shareholder value paradigm" (Sokol, 2015). In this sense, financialization emerges as a relevant interdiciplinary concept to understand the current integration process of stock markets.

Financialization is essentially a spatial process that represents a key feature of contemporary capitalism and its corresponding dynamics (Cloke, 2013). An attractive research subject in financialization is the study of transaction patterns in geographically separated financial markets (Lagoarde-Segot, 2016). Such an attractiveness has mainly been a result of several recently-occurred changes in the financial sector, such as liberalization reforms, financial transaction velocity and speculative trading (Lapavitsas, 2013). With the exception of Lagoarde-Segot (2015), limited progress has been achieved on the

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study of financialization through empirical financial techniques. This work contributes to empirical finances by examining the relation between transaction costs (TCs) and the interaction of financial markets among diverse geographical conditions.

Several studies have investigated topics related to transmission of volatility (contagion) between markets (Barrett and Bellemare, 2011), the behaviour of series correlation during times of high uncertainty (Fulop and Lescourret, 2009) and the role of transaction costs (TCs) on the formation of financial networks (Nagurney, 2003). This last topic is specially important for the construction of international portfolios as well as for the understanding of asset trading relations in a sociopolitical context (Gai and Kapadia, 2010; Cloke, 2010, 2013).

Although there is general agreement that higher TCs affect expected returns and lower trading volumes, a disagreement in the literature regarding the magnitudes of these effects at a geographical level is noticeable. For example, Thapa and Poshakwale (2010) demonstrated that higher TCs lead to higher risk adjusted expected returns. As a result, these returns are highly sensitive to changes in TCs. Additionally, it is well known that investors seeking to maximize their net returns demand compensation for investing in securities with high TCs (Onnela et al., 2003). The value of these securities produces an increase over the rate of return (Baker and Jorgensen, 2012). Higher TCs also lead to longer average holding periods and lower trading volumes, since the higher expected returns offered by high transaction-cost securities attract investors with longer holding periods. As a result, a higher trading costs over a longer investment horizon is better repaid (Habermeier and Kirilenko, 2003).

A special tool for the analysis of financial markets is the market graph. This tool allows the analysis of several hundreds or thousands of relations between instruments. The market graph model is based on the early work of Mantegna (1999) who introduced graphs into the financial literature as a tool for dealing with size and number of relationships between/within economic agents. For example, graph modelling techniques have been previously applied in the banking sector by Boss et al. (2004) to analyze the spread of risk in an interbank system. It has been also used for describing the topology of the interbank payment system. Empirically or theoretically motivated questions can be answered by using graph-specific indicators and econometric methods. For instance, which markets tend to be clustered together?, What type of markets tend to be on the periphery? and why and when do the markets behave similarly?

This work introduces a novel analytical approach for the study of financialization. Such an approach is based on a market graph model which permits the study of relations between stock indexes. Thereby, the main contribution is the analysis of interactions between financial markets by considering both a market graph model and the transaction cost as a measure of integration. As far as the current literature concerns, the employment of transaction cost as a metric to build and analyze a market graph has not been previously addressed by the literature.

In the literature a common technique for dealing with interactions between financial instruments is the estimation of correlation indicators that are focused more on shape similarity between times series of prices. The performance of this type of approach heavily depends on the chronological consistency of the stock performance (e.g., return, volatility) to such an extent that an optimized portfolio could decrease performance for a time period due to an unclear consistency. In contrast, a graph approach provides some unique attributes for each node (stock) such as degree centrality, betweenness centrality and closeness centrality that represent the importance of each stock throughout the whole network. Unlike the correlation approach, these attributes are likely to be consistent over time by assuming that the network structure is consistent chronologically.

In this work, TCs are consider to be capable of explicitly representing the arbitrage between pairs of financial instruments so that the establishment of a relation based on TCs is possible. This relation permits the construction of a market graph which is a less abstract tool for the study of trading dynamics. The understanding of financialization through TCs dynamics opens a whole new research agenda since an approach based on TCs can contribute not only to debates related to arbitrage behaviour among countries, but also to the comprehension of social and economic phenomena within geographically separated financial markets.

The remainder of the article proceeds as follows: Sections 2 and 3 reviews literature related to TC and the market graph approach, respectively. Section 4 introduces the modelling approach. Section 5 describes the data sources and empirical analysis. Section 6 presents results. Finally, Section 7 summarizes the main conclusions.

2. Financialization and TCs in a geographical context

Stock markets are conceptualized as places consisting of issuers, investors and intermediaries that have locations and relate to each other in a physical space such as a region, city or country (Clark et al., 2007). Wójcik (2007) posits that money and finance are inherently a geographical phenomena. According to this author, the most recent financial crisis has geographical origins as well as geographical consequences. This is an indication that geography cannot be ignored in the analysis of financial networks.

The link between financialization and geographically separated markets has been scarcely addressed. In fact, financial geographers have pointed out that dominant debates on financialization are usually detached from geographical issues (Lee et al., 2009). As French et al. (2011) indicate, the literature on financialization has been inattentive to both the role of physical space in trading and the geographical aspects of money and finance. This is an important drawback of financial research since financialization is a deep spatial phenomenon. Sokol (2015) stresses that literature on financialization has so far spanned only three spatial scales (national economic space, firm/corporation and household/individual), whereas regional and international dimensions have been neglected. As a result, geography is regarded as either a mere empirical