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Which information matters to market risk spreading in Brazil? Volatility transmission modelling using MGARCH-BEKK, DCC, t-Copulas

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ABSTRACT

Among a political disorder, there are additional difficulties to predict sources of risk. The objective of this article was to analyze the spillover effects and channels of volatility from and to Brazilian stock market (Bovespa) in the period that goes from 2014 to 2016. In this period, is marked as one of the most volatile periods since the subprime crisis. A political and economic crisis, followed by federal police investigation combined with a period of slow economic growth and unconventional monetary and, a downtrend in commodities prices and in the world, makes the task to identify the sources of price risk dubious. Using a MGARCH-BEKK, DCC and t-Copulas modelling, the main results of the article suggest US monetary policy and rebalancing of portfolios generates volatility to Brazil. However, Bovespa also generates volatility to commodity markets and US bonds market. This is explained by the role that Brazil plays as mediator of these markets when allocators diversify their positions with Latin America and in commodities.

1. Introduction

There is a growing body of evidence that when politicians speak, markets react.¹ However, the volatility generated by their actions, is one of the sources of stock markets risk and choosing the wrong narrative in the decision-making process might be dismal. Whereas most analysts attributed to politics the performance of the stock market index in Brazil, Vladimir Signorelli in Rapazza (2016) qualified investors as misinterpreting Brazilian market appropriately. His understanding was that commodities were pushing Bovespa up.²

Although markets supposedly must fully reflect all the information that matters, decoding the chain of causes and consequences and, time precedence among events are not a trivial task to Policy Makers and portfolio managers. Constantly moved by narratives, market players can use the wrong insight when taking decisions, leading them to disastrous consequences. Particularly, Brazil in the period between 2014 and 2016, presented a natural experiment to attack the problem of which information matters. This period is paramount in the country because is marked as one of the most volatile periods since the sub-prime crisis. A political crisis, combined with the federal police investigation – called in a free translation as “Car Wash” -, and geopolitical events as the BREXIT, expectations about monetary policy, commodities markets movements and presidential elections in USA are relevant information to Brazilian stock market. Therefore, the research question of this paper is which information matters to the spreading of market risk in Brazil.

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¹ See Pastor and Veronesi (2013), Kelly, Pástor, and Veronesi (2016), Pastor and Veronesi (2017).

² The Fig. 1 in Section 6 shows the relationship of GDP, commodities and stock markets; presenting a close relationship between commodities and index stock in Brazil. Analysts likely misinterpreted the drivers of Brazilian market in this period.

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In a highly-integrated world, both in an economical and a financial perspective, issues about temporal cross dependence of assets return gain importance. The recent literature recognizes the existence of financial co-volatility movements. Specially, considering these features, practitioners have the potential to carry out the best decisions of hedging, portfolio selection, pricing of assets and derivatives, and market risk management (Bauwens, Laurent, and Rombouts, 2006). Engle (1982) pioneered the development in financial econometric risk measures, that in advance allows to solve problems of aggregation of risk. Developing multivariate models as MGARCH, CCC, DCC or models with relaxing assumptions of normally distributed returns as Copulas.³

As outlined by Bekaert, Hodrick, and Zhang (2009), co-volatilities have received too much attention because of the highly-correlated risk that marked crises in emerging markets. Nevertheless, contagion and transmission effects are similar, but not the same phenomenon. Whereas contagion is marked by structural breaks in correlation patterns, transmission or spillover effects occur in turbulent and calm periods. A profound discussion about this distinctions are surveyed in Calvo and Reinhart (1996), Dornbusch, Park, and Claessens (2000), Forbes and Rigobon (2002), Marcal and Valls Pereira (2009).

In this regard, this research deals with well-known and expected effect of interdependence that occurred between markets in the absence of a financial crisis, as referred by Forbes and Rigobon (2002). The first hypothesis about the propagation pathway in Brazilian markets refers to institutional investors (pensions funds, hedge funds or commodities investors) creating exposure on commodities markets or other emerging markets highly linked to Brazil throughout Brazilian companies. The motivation behind this strategy is mutually beneficial to these players because they are taking advantage of market price oscillation, dividend payments, liquidity and, reduced costs of transaction compared to spot or derivatives alternatives in case of commodities at the same time.⁴ In this regard, Cardona, Gutiérrez, and Agudelo (2017) attest to the leadership role played by capital market of Brazil in Latin America.

A second hypothesis of spillover risk channel, relates to portfolio allocators pursuing emerging market shares to balance their risk and return strategies. Moreover, institutional investors movements in response to macroeconomic or geopolitical changes in the world might have a consequently endogenous effect in financial risk on markets due capital flow. The literature that understand the channels and capital flow is too wide to survey here, a profound analysis can be found in Bonizzi (2016), Froot and Donohue (2002), Hsieh, Yang, Yang, and Lee (2011).

A correct understanding about the co-dependence between markets and identifying the information that matters is critical to portfolio performance and to policy makers interventions. When designing macro-prudential or stabilization policies, Policy Makers must implement the correct variables in models, and identify the transmission channels of shocks; reducing the uncertainty of policies implementation. On the other hand, Portfolio Managers use the information about dependence among markets as input in risk management models and, macro research. The worst-case scenario of not identifying the relevant information ultimately result in a crisis of the depth, breadth and duration as the sub-prime crisis, where managers, policymakers and regulators got wrong about relevant factors and actions. Moreover, recent crisis revealed the importance of the interdependence between financial institutions and markets to systemic risk (see Ibragimov, Jaffee, & Walden (2011)).

The objective of this article is to identify and analyze the transmission effects and channels of volatility from and to Brazilian stock market. The hypothesis tested here is the existence of these channels because of: (i) Brazil is a mediator of perturbation and volatility of commodities (metals, energy, and agricultural) and Latin American markets; (ii) The volatility of financial market in Brazil is highly dependent of international disturbances (politic, geopolitics, economic); (iii) The fundamentals of the Brazilian economy explain by themselves the volatility in stock markets.

The methodology chosen to test the transmission of volatility to Brazil is based on Cardona et al. (2017), that uses a bi-variate and a trivariate GARCH-BEKK and the estimation is based on Lütkepohl (2005) and Tsay (2013). Even though these models present difficulties to encounter significant parameters, their outcomes are intuitive and objective.

The results are as intuitive as revealing, signaling that not just politics or economic fundamentals were important to explain risk spreading in Brazilian market this period. The main outcomes suggest the stock market in Brazil is affected by unconventional monetary policies in USA, and portfolio rebalancing of institutional investors. Moreover, another important result serves as evidence of an important channel of risk spreading where investors are looking for exposure in commodities markets using commodities of stocks, such Petrobras and Vale.

Besides this introduction, this paper is organized in five additional sections. The next present the literature review, followed by the session that contain data main features. The fourth section discuss the methodology applied, followed by the fifth that presents and evaluate the results. Finally, the sixth section is the conclusion.

2. Literature review

The recent literature on transmission effects is still concerned with the impact of events in economic variables, or about the identification of factors that spread waves of risk among existing channels and with the contagion effect in times of crisis, as well. However, this research expands the literature providing revealing answers to a complex period. It is important to reinforce the period studied represents a natural experiment to study the time precedence and interaction of political, economic and, global events in one market.

The approach here differs slightly from Liu, Hammoudeh, and Thompson (2013) and Hammoudeh, Sari, Uzunkaya, and Liu

³ Patton (2009) presents a broad discussion about using Copula functions when modelling financial times series, and their desirable density distribution assumptions to risk modelling.

⁴ This argument can partially be found here: <https://bloom.bg/2DKV19j> - "Why Commodity Investors Should Focus on Dividend-Paying Equities"

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