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The effects of the subprime crisis on the Latin American financial markets: An empirical assessment

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ABSTRACT

The aim of this article is to answer the following question: can the considerable rise in the volatility of the LAC stock markets in the aftermath of the 2007/2008 crisis be explained by the worsening financial environment in the US markets? To this end, we rely on a time-varying transition probability Markov-switching model, in which "crisis" and "non-crisis" periods are identified endogenously. Using daily data from January 2004 to April 2009, our findings do not validate the "financial decoupling" hypothesis since we show that the financial stress in the US markets is transmitted to the LAC's stock market volatility, especially in Mexico.

1. Introduction

This paper examines empirically the relationship between the rise in volatility of the Latin American countries (LAC) and the worsening in the financial environment in the US market in the aftermath of the 2007/2008 crisis. We study the respective roles of local factors (regional volatility) and US financial stress factors in the dynamics of the stock market volatility of five LAC (Brazil, Chile, Colombia, Mexico, and Peru). We show that the financial stress in the US markets is transmitted to these countries' stock market volatility, but not in the same scale. Our findings support the idea of heterogeneity among the LAC markets, in the sense that the 2007/2008 subprime crisis did not equally affect all the countries, despite the fact that high volatility of the equity prices was observed everywhere. This is in accordance with the two views that have been at the centre of the policy debate in Latin America regarding the vulnerability of the financial markets to the subprime crisis.

On the one hand, one may claim that the LAC's banking and financial sectors showed resilience to the crisis and put forward the thesis of a financial decoupling with respect to the rest of the world (see Powell and Martinez (2008) and Pereira Valadao and Gico (2009) among others). Although the countries initiated vast liberalization reforms of their financial markets, they still had a low market capitalization, a weak financial depth and the banking intermediation represented almost 90% of the non-financial corporate financing before the crisis. The spectacular development of market capitalization was the fact of only a few big companies. Furthermore, many domestic banks remained solvent and profitable, had healthy capital adequacy ratios and median return on equity. Above all, the domestic banks held few of the "toxic assets" that triggered the subprime crisis. According to this view, the crisis in the LACs was essentially the consequence of a factor that is not related to a "financial channel", namely the precipitous decline in prices of raw materials which reversed the growth rates of the last five

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years.[3] So, a downward movement in the terms of trade was the dominant factor of the economic collapse (International Monetary Fund (IMF) (2008), Powell and Martinez (2008) and Pereira Valadao and Gico (2009)).

On the other hand, one can think about the influence of financial factors, given the degree of integration between the LAC's financial markets and the United States'. Empirical papers studying the co-movements across stock markets report increasing correlations during the past five years, especially since 2007 (see Gonzalez-Hermosillo and Hesse (2009)). Studies by the International Monetary Fund (IMF) (2008) also point to spillover effects from the US financial markets to the LAC's through different channels (equity market channel, market risk premium, global credit, etc.). Besides, there are cross-border effects implying that LAC financial markets are integrated with advanced economies. Indeed, many LAC have endured the sharp decrease in the US liquidity market (a typical example is Mexico), have suffered from funds withdrawals (as foreign banks transferred resources to their central offices), and the equity markets accumulate losses that threat the life of some companies (examples are Chile and Colombia).

We do not examine in this paper the question as whether the financial stress in the US during the subprime crisis propagated to the LAC through real or financial channels. Recent studies show that these channels were in fact intertwined (for an illustration, see Paiva (2009)). We rather concentrate on the financial linkage and examine empirically the link between the US subprime crisis and the volatility of the LAC stock markets. There are several motivations to focus our attention on volatility. First, volatility of equity prices is usually viewed as an indicator of financial stress for the different segments of financial markets. Secondly, over the last ten years, the volatility of LAC financial markets has become a key determinant for explaining the risk-taking behaviors of investors, especially the substitution in their portfolios between different categories of securities (corporate and government bonds). Thirdly, as volatility tends to decline (resp. increase), it releases (resp. augments) risk budgets of financial firms and encourages (resp. discourages) position-taking. In particular, during the subprime crisis, the observed changes in volatility determined adjustments in domestic balance sheets and leverage conditions.

We thus aim at answering the following question: can the considerable rise in the volatility of the LAC equity markets in the aftermath of the 2007/2008 crisis be explained by the worsening financial environment in the US markets? As previously mentioned, the answer to this question is not straightforward. Indeed, due to the disastrous consequences of the financial crises they faced during the decades of 1990 and 2000, LAC's policymakers adopted measures aiming at insulating their markets from external shocks. Firstly, they adopted macroeconomic policies to avoid future crises due to flawed fundamentals.[4] Secondly, there was a passionate debate among the policymakers regarding the opportunity of adopting measures such as capital controls as a management tool in times of crises. Mexico and Argentina opted for a total liberalization, while Brazil, Chile and Colombia chose to adopt capital controls during the years preceding the 2007 crisis. The question of financial decoupling is still a debated issue in Latin America.

Several econometric models have been used in the literature to study the coupling and decoupling between the LAC stock markets and financial stress in international capital markets. Recent studies have looked at this issue during the subprime crisis (Frank et al. (2008), Berglof et al. (2009), Gonzalez-Hermosillo and Hesse (2009), Rose and Spiegel (2009)). In terms of model specification, many of them rely on VAR models, multivariate GARCH models, or time-varying common factor models. In this paper, we re-examine this issue using a more powerful econometric tool, namely a time-varying transition probability Markov-switching model (TVPMS) proposed by Kim et al. (2008). Compared to the previous ones, this model has the advantage of being helpful in investigating whether the impact of the financial stress indicators is nonlinear, with an influence differing between crisis and non-crisis episodes. Crisis and non-crisis regimes are identified endogenously, and the switch from one regime to the other can happen at any time. In other words, contrasting with structural break models, the time of the changes is not forced *a priori*, and we do not separate, *ex ante*, the sample into two parts with respect to a given time. Our study therefore contributes to the empirical literature on financial contagion, as it investigates the transmission mechanisms of crises.[5]

The rest of the paper is organized as follows. Section 2 presents the data, some stylized facts on the volatility of the LAC equity markets and their links with the US market. They suggest both the presence of an asymmetric dynamics and co-movements with the financial stress indicators in the US markets. In Section 3, methodological concerns relating to TVPMS models are outlined. In Section 4, we estimate and comment the different TVPMS models. Finally, Section 5 concludes.

2. Data and stylized facts on the volatility of LAC stock markets in the aftermath of the subprime crisis

2.1. Data

We investigate the links between the financial markets of the US and five Latin American countries for which we have a complete database: Brazil, Chile, Colombia, Mexico, and Peru. To this end, we use daily data for the following series: equity market indices for the five considered Latin American countries. To ensure that our results are not specific to a particular stock price series, two equity indices are considered for each country. On the one hand, we rely on the S&P/IFCI price indices, that are subsets of S&P/IFCG indices,[6] and measure the returns of stocks that are legally and practically available to foreign investors. On the other hand, we use the following stock market indices: (i) BOVESPA price index for Brazil, (ii) Chile INTER10 price index for Chile, (iii) IGBC price index for Colombia, (iv) BOLSA price index for Mexico, and (v) LIMA SE price index for Peru.

To choose the financial variables that could have affected the LAC equity price volatility, we refer to the literature[7] suggesting that several adverse spillover effects may explain the transmission of the global crisis to the LAC's financial sectors: (i) the slowdown in total lending by foreign parent banks to their local affiliates due to liquidity constraints in interbank markets (credit crunch transmission channel), (ii) sudden stop effects implied by liquidity risks in the international markets and inducing withdrawals of liabilities owed to nonresidents, (iii) the lack of access to foreign borrowing, (iv) the losses associated with foreign exchange derivative positions, and (v) banks' exposure to stock market fluctuations. As the global crisis originated in the financial markets of the industrialized countries, these channels are expected to be closely tied with financial stress indicators, particularly those reflecting market and liquidity risks: ABCP (asset-backed commercial papers) and CDS (credit default swap) spreads, bank funding liquidity, stock market liquidity. We use the US S&P 500 stock market index whose squared returns act as a

[3] In this paper we focus our attention on the "financial channel" and on testing the financial decoupling hypothesis. While interesting, the question as whether the LAC equity markets were affected by the subprime crisis through raw materials or real channels is beyond the scope of the paper.

[4] The IMF economic outlooks for LAC in 2007 and 2008 show that these countries had good economic fundamentals during the subprime turmoil.

[5] For other recent contributions, see Dungey et al. (2010), Aloui et al. (2011), Barba and Ceretta (2011), Breuss (2011).

[6] S&P/IFCI indices typically cover a high percentage of the stocks in the S&P/IFCG indices.

[7] See International Monetary Fund (IMF) (2008) and Berkmen et al. (2009).