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## North American Journal of Economics and Finance



# Impact of macroeconomic surprises on the Brazilian yield curve and expected inflation



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### ARTICLE INFO

#### Article history:

Received 4 September 2012

Received in revised form 13 December 2013

Accepted 16 December 2013

#### JEL classification:

E43

E44

#### Keywords:

Yield curve

Implicit expected inflation curve

Real interest rates curve

Macroeconomic surprises

Global financial crisis

### ABSTRACT

This study investigates how unexpected announcements in Brazilian and U.S. macroeconomic indicators affect the term structure of nominal interest rates, as well as implicit inflation expectations and real interest rates. Using daily data from March 2005 to December 2012, we employ an extended Vector Error Correction Model to take into account nonstationarity and the long-term equilibrium among different maturities of those curves. We found empirical evidence that macroeconomic surprises, domestic (Brazilian) and external (U.S. American), which lead the market to believe that there might be a higher risk of inflation or an overheated economy, raise nominal interest rates, implicit expected inflation and real interest rates. Surprisingly, in relation to the efficient-market hypothesis, we found that some macroeconomic surprises have a lagged effect on the yield curves. We also tested the impact of the global financial crisis of 2007–09 and found that the crisis affected significantly the direction and magnitude of the responses to macroeconomic news.

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## 1. Introduction

Brazil is one of the largest economies in the world, placing in 7th place in terms of total GDP in 2012, according to the International Monetary Fund. The relevance of the Brazilian economy is not just being the “B” of the BRICs acronym – Brazil, Russia, India and China, a worldwide known term

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coined in a Global Economics Paper of Goldman and Sachs in 2001.<sup>1</sup> Similar to the largest developed countries, which rank among the top ten largest economies, Brazil has a free-market economy with a democratic government. Although its GDP growth rate has not overtaken China or India recently, Brazil is the third largest recipient of foreign direct investments (hereinafter FDI), with an average of \$66 billion per year in 2011–12, compared to \$240 billion for China and \$205 billion for the U.S., according to OECD figures.<sup>2</sup>

The Brazilian financial markets are very active. The main stock exchange, BM&FBovespa, is the largest in South America and one of the largest in the world. At the end of 2012, its 364 listed companies had a total market capitalization of around R\$2.4 trillion in local currency, approximately \$1.2 trillion in 2012 average exchange rates,<sup>3</sup> placing BM&FBovespa 8th in the world in terms of market cap of its listed companies. Average daily trading is in the order of R\$7.3 billion (\$3.7 billion) per day. Being a listed company itself, BM&FBovespa had a market value of R\$27.7 billion (\$14.7 billion) at the end of 2012, ranking it as the third largest stock exchange in the world in terms of its own market value.<sup>4</sup>

Besides being responsible for intermediating equity markets, the BM&FBovespa is the only securities, commodities and futures exchange in Brazil. As we will demonstrate below, Brazil has one of the largest and most active markets for interest rate derivatives in the world. In particular, this study will explore two of the most traded interest rate derivatives of the Brazilian market that provide benchmark interest rate curves for nominal and real interest rates.

This study is motivated by the fact that Brazil, despite its prominence in the emerging economies group and its very active financial market, is precariously studied in the literature on the impact of macroeconomic surprises. To the best of our knowledge, this is the first paper to investigate how the Brazilian term structure of nominal interest rates, implicit inflation expectations and real interest rates react to an extensive set of domestic and external macroeconomic news. This is also the first study to explore some of the unique aspects of the large Brazilian market for interest rate derivatives. Other related studies for the Brazilian economy focused on more restricted or different aspects, as we will clarify in the next section. In short, the research questions this study aims to answer are:

1. How do Brazilian interest rates respond to announcements surprises for a large set of macroeconomic indicators?
2. Does U.S. macroeconomic news affect Brazilian interest rates?
3. How are those nominal impacts split between real interest rates and implicit expected inflations?
4. Are there any delayed effects left for the next day of the announcements?
5. How did the recent global financial crisis of 2007–2009 affect the findings?

The remainder of this paper is organized as follows. Section 2 discusses the related literature and highlights our contribution. Section 3 describes our data sample and the methodology to construct the macroeconomic surprises. Section 4 discusses our econometric methodology and explores diagnostic tests on the data. Section 5 reports and discusses our empirical results for the impact of contemporaneous and lagged surprises, as well as the effect of the global financial crisis of 2007–09, hereinafter GFC, on our estimates. Section 6 concludes the study and examines limitations and future research.

## 2. Literature review and how we contribute to it

According to the efficient-market hypothesis proposed by Fama (1970), asset prices are instantly influenced by the arrival of new information. Indeed, a large body of literature shows that asset prices react to macroeconomic surprises (Andersson, 2010; Bernanke & Kuttner, 2005; Ederington & Lee, 1993; Fatum & Scholnick, 2008; Frino & Hill, 2001; Gurkaynak, Sack, & Swanson, 2005a, 2005b; Kuttner,

<sup>1</sup> O'Neill (2001).

<sup>2</sup> Bertrand and Kothe (2013).

<sup>3</sup> Average rate of 1.96 BRL/USD, source: Datastream.

<sup>4</sup> Source: BM&FBovespa annual and monthly reports, found at [http://ri.bmfbovespa.com.br/ptb/1694/RELATORIOANUAL2012PORTUGUESVFINAL\\_raster.pdf](http://ri.bmfbovespa.com.br/ptb/1694/RELATORIOANUAL2012PORTUGUESVFINAL_raster.pdf) and <http://ri.bmfbovespa.com.br/ptb/1869/ApresentaoMensalBVMFMAgosto2013.pdf>.

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