Lost in translation?
Price Discovery and Earning Conference Calls

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Introduction

**Earnings conference calls** are large-scale telephone conference calls during which company managers make presentations and answer questions about recent earnings.

**Why care?** Earnings calls generally convey material information to the market as evidenced by significant increases in return volatility and trading volume during the actual call periods (Frankel et al., 1999; Bushee et al., 2003).
Market securities trade on multiple exchanges both across domestic and international markets.

**Price discovery** refers to innovations in the efficient price. Schreiber and Schwartz (1986): the search for an equilibrium price.

**Information share** is a market’s contribution to price discovery defined as the proportion of the efficient price innovation variance that can be attributed to that market.

**Why care?** Price discovery the most important product of security markets. Price discovery as *public good*. Where does new information gets impounded into prices?
Introduction

- We look at cross-listed Brazilian firms traded at New York stock exchange (NYSE) and the B3 in Sao Paulo.

- Earning conference calls have the following language combinations:
  1. Portuguese first, then English
  2. Portuguese and English simultaneously
Introduction
Cross-Listed firms

Table: List of the number of English and Portuguese earning calls in our sample

<table>
<thead>
<tr>
<th>Firm</th>
<th>Industry</th>
<th>Eng. calls</th>
<th>Port. calls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sequential call firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banco Bradesco</td>
<td>Banking</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Banco Santander</td>
<td>Banking</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Gol</td>
<td>Airline</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Itau Unibanco</td>
<td>Banking</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>50</strong></td>
<td><strong>28</strong></td>
</tr>
<tr>
<td><strong>Simultaneous call firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grupo Pao de Acucar</td>
<td>Retail</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Copel</td>
<td>Electricity</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CPFL Energia</td>
<td>Electricity</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Embraer</td>
<td>Manufacturing</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>35</strong></td>
<td></td>
</tr>
</tbody>
</table>

We require a validation with Eikon/Bloomberg data and overlap with trading hours.
Data sources

- **Earnings calls** from the Brazilian Investor Relations Institute (IBRI)
  - Day, exact start and end time (up to second), language and sequential/simultaneous nature of call
  - Covers all firms on the IBOVESPA index of the B3
  - Covers earnings calls from Q1 2010 to Q4 2014
  - Cross-checked with Bloomberg and Eikon (many errors!)

- **Security prices** from the Thomson Reuters Datascope platform. We use second level backfilled mid-quotes data. We use only data post 2012. Before this, data very noisy.
The B3 dominates the NYSE in terms of the volume traded.
Research questions

1. Does the NYSE or the B3 contribute more towards price discovery of cross-listed Brazilian firms?

2. How do information shares change over time?

3. What is the day effect of earning calls on the price discovery process?

4. What is the role of language of earning calls for cross-listed stocks on the price discovery process?
The method
A security is traded on two markets. Prices are given as

\[ \begin{align*}
    p_{1,t} &= p_{1,t-1} + w_t, \\
    p_{2,t} &= p_{1,t-2} + \epsilon_t.
\end{align*} \]

The \( p_{i,t} \) are transaction prices or quotes. The \( w_t, \epsilon_t \) are i.i.d. innovations.

The difference of the two prices is stationary, and the two prices cointegrate, as

\[ p_{1,t} - p_{2,t} = p_{1,t} - (p_{1,t-2} + \epsilon_t) = w_t + w_{t-1} - \epsilon_t. \]
Different representations for intuition

- Vector moving average representation

\[ \Delta p_{1,t} = w_t \]
\[ \Delta p_{2,t} = \Delta p_{1,t-2} + \epsilon_t - \epsilon_{t-1} = w_{t-2} + \epsilon_t - \epsilon_{t-1}. \]

- Common trends representation

\[ p_{1,t} = p_{1,0} + \sum_{s=1}^{t} w_s \]
\[ p_{2,t} = p_{2,0} + \sum_{s=1}^{t} w_s + (-w_t - w_{t-1} + \epsilon_t) \]
There are infinitely many error correction representations, each corresponding to the same VMA. A error correction representation is

\[ \Delta p_{1,t} = w_t \]
\[ \Delta p_{2,t} = (p_{1,t-1} - p_{2,t-1}) - \Delta p_{1,t-1} + \epsilon_t. \]

An alternative is

\[ \Delta p_{2,t} = (p_{1,t-2} - p_{2,t-2}) - \Delta p_{2,t-1} + \epsilon_t, \]

or even

\[ \Delta p_{2,t} = (p_{1,t-2} - p_{2,t-1}) + \epsilon_t. \]

Intuitions: Traders in the second market are responding to the price discrepancy.
There are two price variables related to a single security in vector $p_t$. Each price is assumed to $I(1) \Rightarrow$ price changes are covariance stationary and can be represented as a vector moving average

$$\Delta p_t = \psi(L)e_t$$

where $e_t$ are i.i.d. innovations and $\psi$ is a polynomial in the lag operator. The price level then is

$$p_t = p_0 + \psi \left( \sum_{s=1}^{t} e_s \right) \iota + \Psi^*(L)e_t,$$

where $\iota$ is a column unit vector, $\psi$ is the common row vector in $\Psi(1)$ and where $\Psi^*$ is a polynomial in the lag operator.
The definition of the Information Share

In our model of the market price of a security,

\[ p_t = p_0 + \psi \left( \sum_{s=1}^{t} e_s \right) \iota + \Psi^*(L)e_t, \]

where \( e_t \) has covariance matrix \( \Omega \). The component \( \psi e_t \) is permanently impounded into the security price. The variance of this term is \( \psi \Omega \psi' \).

**Definition**

The **information share** of market \( j \) with diagonal \( \Omega \) is defined as

\[ S_j = \frac{\psi_j^2 \Omega_{jj}}{\psi \Omega \psi'}. \]
The Information Share with non-diagonal $\Omega$

How to deal with price innovations that are correlated across markets?

- Shorten the sampling intervals. We work with 1 sec data.
- Triangulate the covariance matrix with a Cholesky decomposition of $\Omega$ such that $\Omega = FF'$ and $\epsilon_t = Fz_t$. Then the information share is

$$S_j = \frac{([\psi F]_j)^2}{\psi \Omega \psi'},$$

where $[\psi F]_j$ is the $j$th element in the row matrix of $\psi F$. 
The results
Dialy information shares of sequential call firms
Dialy information shares of simultaneous call firms

Grupo Pao de Acucar: Information Share NY

COPEL: Information Share NY

CPFL Energia: Information Share NY

EMBRAER SA: Information Share NY
Lost in translation!

During sequential calls *larger* drop in the IS of NY than during simultaneous calls.

<table>
<thead>
<tr>
<th></th>
<th>Av. IS of NY on days with calls</th>
<th>Change in IS of NY during calls</th>
<th>Difference IS of NY Port. vs. Eng.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sequential call firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banco Bradesco</td>
<td>65%</td>
<td>−30%</td>
<td>−4%</td>
</tr>
<tr>
<td>Banco Santander</td>
<td>63%</td>
<td>−4%</td>
<td>−0.4%</td>
</tr>
<tr>
<td>Gol</td>
<td>58%</td>
<td>−3%</td>
<td>5%</td>
</tr>
<tr>
<td>Itau Unibanco</td>
<td>66%</td>
<td>−14%</td>
<td>−6%</td>
</tr>
<tr>
<td></td>
<td><strong>63%</strong></td>
<td>−12.75%</td>
<td>−1.35%</td>
</tr>
<tr>
<td><strong>Simultaneous call firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grupo Pao de Acucar</td>
<td>72%</td>
<td>−5%</td>
<td></td>
</tr>
<tr>
<td>Copel</td>
<td>70%</td>
<td>−2%</td>
<td></td>
</tr>
<tr>
<td>CPFL Energia</td>
<td>74%</td>
<td>−10%</td>
<td></td>
</tr>
<tr>
<td>Embraer</td>
<td>76%</td>
<td>−5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>73%</strong></td>
<td>−6.75%</td>
<td></td>
</tr>
</tbody>
</table>
1. Does the NYSE or the B3 contribute more towards price discovery of cross-listed Brazilian firms?
   ▶ Answer: Surprisingly it’s the NYSE despite lower volume than the B3.

2. How do information shares change over time?
   ▶ Answer: More and more information about Brazilian firms gets impounded in Brazil.

3. What is the day effect of earning calls on the price discovery process?
   ▶ Answer: It depends. Some calls disrupt the usual price discovery process.

4. What is the role of language of earning calls for cross-listed stocks on the price discovery process?
   ▶ Answer: During portuguese language calls, the price discovery in portugal gains in importance.