

Metal Prices, Stock Returns and Stock Market Volatility

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Introduction

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- This relevance also occurs in the Peruvian Stock Market, where mining stocks constitute the most important sector due to its strong participation in terms of size and traded volume
- Given this fact and despite a recent increase in diversification, the Peruvian Stock Market has been historically considered as a **mining stock market**.

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Peruvian Stock Market

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- In 2009 the LSE had 258 stocks listed with a total market capitalization of USD 107 billion which represents about 80% of the national GDP.
- A strong particularity of the LSE is the large size of its mining sector; regardless of having 26 listing companies (around 10% of total listing companies), it accounts up to 56% of the total market capitalization and 35% of the total volume traded.

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Literature

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- Moreover, as far as we know there is no academic literature studying the effects of metal returns and volatilities on mining stocks nor indexes of the Peruvian Stock Market.

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Purpose

- We used multivariate GARCH models in order to model volatility spillovers and commovements in returns for the main peruvian mining stocks, the IGBVL index and the metals traded in the London Metal Exchange.

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- We used multivariate GARCH models in order to model volatility spillovers and commovements in returns for the main peruvian mining stocks, the IGBVL index and the metals traded in the London Metal Exchange.
- This has important implications for portfolio selection, risk management and asset pricing.

Data

- Mining stocks: Southern, Buenaventura, Volcan (together 39% of Market Cap and 15% of volume)
- IGBVL (82% of total market operations and 89% of total volume traded)
- Metals: gold, silver, copper, lead, zinc

Table: Data Range

Time Series	Initial date	Final date	Number of Obs.
Southern (PCU)	2000-05-17	2010-09-22	2540
Buenaventura (BVN)	2001-01-02	2010-09-22	2365
Volcan (VOLCABC1)	2001-01-02	2010-09-22	2226
IGBVL	2002-01-02	2010-09-22	2053

Models

BEKK

Let $r_t = (r_{t1}, \dots, r_{tk})^\top$ a multivariate time series of returns, $t = 1, \dots, N$. Assume that

$$r_t = \varepsilon_t H_t \quad (1)$$

where $\varepsilon_t \sim St(0, I, \nu)$.

- $E(r_t | \mathcal{F}_{t-1}) = 0$
- $Var(r_t | \mathcal{F}_{t-1}) = H_t$
- Time varying conditional correlation,

$$\rho_{ij,t} = h_{ij,t} / \sqrt{h_{i,t} h_{j,t}} \quad (2)$$

- BEKK(1,1)

$$H_t = W + A r_{t-1} r_{t-1}^\top A^\top + B H_{t-1} B^\top, \quad (3)$$

Results

Fitted models

- Southern and copper
- Buenaventura, gold and silver
- Volcan, zinc, silver and lead
- IGBVL, gold, silver and copper

Fidings

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- *Short run shock interdependency.* Accounts the effect of $r_{t-1,metals}^2$ on mining stock's volatility. This feature is observed in all fits with exception of Southern.
- *Volatility interdependency.* Related with the impact of previous cross volatilities or conditional correlation.

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- We can distinguish four situations related to metal volatilities: (1) a flat behaviour at the beginning of the decade, then (2) a *rush* in volatility in accompaniment of a general rise in metal prices. Later (3) the impact of Lehman's Brothers fall increasing volatilities, finally followed by (4) a period of volatility levels similar to the first period.

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- We observe a time-varying behaviour of conditional correlations.
- Here we can also observe four periods for correlations: (1) a small, but important correlation, at the begining of the decade, then (2) a period of increasing correlation with two falls related with the subprime crisis and Lehman Brothers fall, then (3) a period of strong correlation along with recovery and finally (4) a decreasing trend in correlations (to pre-crisis levels), most visible for Buanventura but much less for Volcan.

Further Research

- Multivariate fine tuning modeling
- Structural specification
- Asymmetric shocks