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Commodity-price volatility and macroeconomic spillovers: Evidence from nine emerging markets

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ABSTRACT

The recent decade has witnessed wild swings in global commodity prices, with large increases preceding the Global Financial Crisis and steep declines following the crash. Many emerging markets find themselves destabilized by these fluctuations, not only when price increases lead to currency appreciations and reduced competitiveness, but also when price decreases cause capital outflows and deteriorations in the balance of payments. This study examines the volatility processes of six major commodity prices, before applying Multivariate GARCH analysis to examine spillovers among important commodity prices and output, exchange rates, interest rates and inflation in major emerging markets. While each commodity and each country behaves differently, we find that Chile is most closely tied to the copper price, and Indonesia to oil and tin, while neighbors such as Brazil and the Philippines are less affected. Perhaps surprisingly, Russia is found to be highly insulated from fluctuations in world oil prices.

1. Introduction

With recent growth in emerging markets increasing the world's appetite for raw materials, many commodity-producing countries saw their economies buoyed—before a slowdown abroad led to a

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reduction in raw-material exports. Dependent upon specific exports, these economies are particularly susceptible to fluctuations in world markets. Commodity-price volatility not can only spill over to a country's exchange rate or output, it can also force policymakers to react, with subsequent impacts on interest rates and inflation. This can hold true for all emerging markets, even those with more diversified economies. Additionally, as was shown by the price spike that preceded the 2008 global financial crisis, the impact of commodity-price fluctuations on macroeconomic volatility needs not be confined to the so-called "commodity currencies." In the U.S., many worried of a return to 1970s-style stagflation.

While fluctuations in commodity prices can have strong linkages with the entire macroeconomy, currencies are often thought to be most closely connected. Since commodity exports bring in foreign exchange, any volatility can have a direct impact on the balance of payments. Cashin, Céspedes, and Sahay (2002) found a number of countries' currencies to exhibit such linkages; this study shows a few (such as Chile) to have further connections. Hegerty (2013, 2014) finds that commodity-price declines place pressure on currencies in West Africa and Latin America, respectively.

Since many emerging markets' government expenditures are financed via export revenues (Russia is a prime example, with its budget only in balance if the oil price is sufficiently high), a drop in commodity prices could therefore result in a reduction in GDP. But other macroeconomic variables are important as well; leaders might implement countercyclical monetary policies to avert such a decline, resulting in increased interest-rate volatility. As Van der Ploeg and Poelhekke (2009), note, both oil and non-oil price volatility reduces economic growth and helps contribute to the so-called "resource curse." This is particularly true in emerging markets, which often lack the financial-market tools required to mitigate such shocks. Needless to say, there are also myriad channels by which the purely macroeconomic variables might influence each other. We examine these linkages alongside the key relationships in this paper.

This study examines the effects of commodity-price volatility on nine emerging markets, using monthly data that begin as early as 1980. Applying a standard Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, we first plot the univariate volatility processes of the prices of oil and four other commodities. Then we apply a multivariate Vector Autoregressive VAR(1)–GARCH model for each country, including monthly log changes in output, interest rates, consumer prices, exchange rates, and the price of each country's important commodity. We find that countries such as Chile are truer "commodity currencies" than is Russia, for example. While Russia's dependence on oil exports is often discussed, our findings show that shows that oftentimes our expected results are not empirically supported.

1.1. Relationship to the literature

Previous studies fall into two groups: those that focus primarily on modeling the volatility of specific commodities, and those that examine spillovers between commodity prices and exchange rates, stock prices, or output. Relatively few have looked at the interactions between all important macroeconomic variables. Among those that have analyzed volatility itself, Beck (2001) applies ARCH methods to annual data (including coffee and copper prices) and finds that only storable commodities have time-varying volatility. This analysis was later repeated by Dahl and Iglesias (2009), who found time-varying volatility among all classes of commodities. Other studies of this type compare GARCH models versus competing alternatives. Bernard, Khalaf, Kichian, and Mcmahon (2008) do so for aluminum prices and find that while non-GARCH models often perform better, no GARCH variation (such as exponential GARCH) is preferred over the others. Choi and Hammoudeh (2010) use different techniques (including regime-switching methods) to model weekly spot prices of commodities such as West Texas Intermediate (WTI) and Brent (UK) oil, copper, and gold. Much like other studies in the second branch of the literature, the authors also look at co-movements with the S&P500 stock index.

In the second group, exchange rates are treated as the most important macroeconomic variable, followed by output. Bui and Pippenger (1990) examine the link between "sticky" commodity prices and "volatile" exchange rates, while Smith (1999) examines whether commodity prices vary under fixed and floating exchange rate regimes, because of the potential of spillovers from currency fluctuations. At the same time, the direction of causation may be uncertain: Chen, Rogoff, and Rossi (2010) test