Futures Trading and the Excess Co-movement of Commodity Prices

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The authors empirically reinvestigate the issue of the excess co-movement of commodity prices initially raised in Pindyck and Rotemberg (1990). Excess co-movement appears when commodity prices remain correlated even after adjusting for the impact of fundamentals. The authors use recent developments in large approximate factor models to consider a richer information set and adequately model these fundamentals. They consider a set of eight unrelated commodities along with 184 real and nominal macroeconomic variables, from developed and emerging economies, from which nine factors are extracted over the 1993–2013 period. Their estimates provide evidence of time-varying excess co-movement which is particularly high after 2007. They further show that speculative intensity is a driver of the estimated excess co-movement, as speculative trading is both correlated across the commodity futures markets and correlated with the futures prices. Their results can be taken as direct evidence of the significant impact of financialization on commodity-price correlations.

Introduction

This paper revisits the issue of the excess co-movement of commodity prices in the context of a growing financial influence in commodity markets for the past two decades. Pindyck and Rotemberg (1990) (PR hereafter) define excess co-movement as commodity prices remaining correlated after adjusting for common macroeconomic variables representing aggregate demand and supply.

In this context, one major issue is the selection of the common macroeconomic variables to filter commodity returns. A first contribution of the paper is to use the large factor approximate modelling approach of Stock and Watson (2002a, 2002b) to extract significant indicators from a set of 184 macroeconomic variables of developed and emerging countries. The authors find that commodity returns are explained by the first extracted factor, that is highly correlated with the real variables of emerging countries, and by the second factor, that is correlated with the nominal variables. These findings highlight the role played by these emerging countries in shaping commodity prices in the recent years. The authors further investigate the behavior of excess co-movement through time.

A second contribution of the paper is to study the empirical relationship between excess co-movement and speculative activity in commodity futures markets. Using data from the U.S. Commodity Futures Trading Commission (CFTC), the authors find empirical evidence that an indicator of speculative trading is able to explain this excess co-movement. These results give support to Barberis and Shleifer (2003)'s contention that investors view commodities as a single "commodity style" asset and lends indirect support

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to the theoretical model of Basak and Pavlova (2016) which predicts that the correlation between commodity returns can be explained by the positions of institutional investors.

Filtering Commodity Returns with Macro Variables

The analysis is based on monthly observations from February 1993 to November 2013 for a sample of 8 commodities[1] which are representative of the main commodity classes. Arguably, according to their negligible supply and demand cross-elasticities, these commodities should be unrelated. Instead, as a first step, the authors find 15 positive and significant correlations between their commodity returns.

To explain the correlations, the authors put together a comprehensive set of 184 real and nominal macroeconomic variables for developed countries (Australia, Canada, France, Germany, Japan, the U.K., and the U.S.; 118 variables in total) and emerging countries (China, Brazil, Korea, Taiwan, Mexico inter alia; 66 variables). The real variables are country-specific measures of aggregate economic activity (e.g., industrial production index, manufacturing orders, and capacity utilization) and the nominal variables are country-specific monetary aggregates, stock indices, interest rates, price indices, and exchange rates.

The static large factor model of Stock and Watson (2002a) is used to extract key common information from the comprehensive set of macro variables. Each variable is split into a component driven by a small set of common factors and an idiosyncratic component. The factors obtained by the principal components method are ordered according to their explanatory power from largest to smallest. The authors focus on the first 9 factors that explain around 37% of the total variation in the original set of 184 macroeconomic variables. As in Stock and Watson (2002b) and Ludvigson and Ng (2009), the authors consider all possible groupings of these factors to select per commodity the regression specification for returns, which minimizes the Bayesian Information Criterion. Finally, the Seemingly Unrelated Regression (SUR) approach is used to jointly estimate the 8 commodity regressions selected.

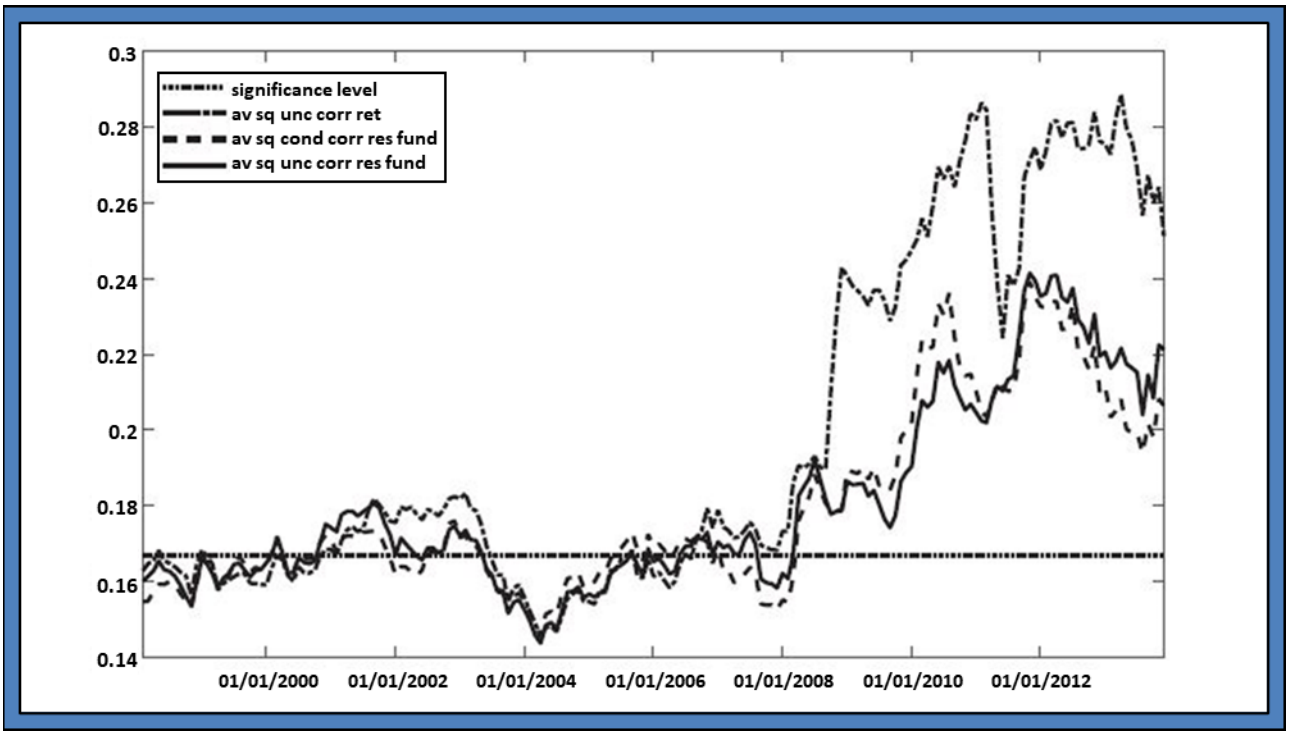
In spite of the large set of macro variables considered, the extracted factors explain only a small part of the variation in the commodity returns, except to a certain extent for copper and crude oil. The most significant factors are the first and second one. The first factor is mostly correlated with real variables from emerging countries. Its correlation with some commodity returns shows the role played by emerging countries in shaping commodity prices in recent years. The second factor is mostly correlated with nominal variables which reaffirms earlier contentions (Barsky and Kilian, 2002; Frankel and Rose, 2010) about the relationship between interest rates and commodity price movements.

Excess Co-movement of Commodity Returns

Next the authors examine the filtered commodity returns (i.e., the residuals from the SUR regressions) and observe that filtering out the common macroeconomic effects reduces only marginally the number of significant cross-correlations. At the 5% significance level, 10 out of 15 correlations are still significant, which is interpreted as evidence of excess co-movement. The authors compute a global, unbiased and time-varying indicator of excess commodity co-movement by deploying the Forbes and Rigobon (2002) unbiased estimator to compute each residual correlation recursively through 30-month rolling windows.

The indicator thus computed as the mean of the squared unbiased correlation for all commodities gives an overall picture of the pattern of excess co-movement, as shown in Figure 1.

Figure 1
Mean Excess Squared Correlation for Commodity Raw/Filtered Returns



Notes: (i) "av sq unc corr ret" is the average squared unconditional correlation for the original (or raw) returns. (ii) "av sq cond corr res fund" is the average squared correlation of filtered returns. (iii) "av sq unc corr res fund" is the average squared correlation corrected for heteroscedasticity-robust filtered returns. Significance level is the minimum value above which a squared correlation is significant at 5% level.

The excess co-movement indicator is significant at the 5% level only half of the time in the period under consideration. We thus conclude that the excess co-movement in commodity prices cannot be viewed as a general feature of commodity markets; it is instead a time-dependent phenomenon. As revealed by Figure 1, the excess co-movement provides is mostly significant during periods of financial crisis: from mid-2000 to early 2003, and from 2008 onwards. In their "convective risk flows" model, Cheng *et al.* (2015) show that financial traders (speculators) cut their net long positions in response to market distress. A coordinated drop in the long positions of financial traders may thus help explain excess co-movement. Alternatively, excess co-movement may also reflect a "flight-to-quality" phenomenon, where investors decide to partly leave the stock market and invest heavily in commodities to diversify their positions. Moreover, the period starting in 2000 also corresponds to the growing financialization of commodity futures markets, as surveyed in Cheng and Xiong (2014). As such, the excess co-movement might be induced by speculative activity in commodity futures markets, a conjecture that the authors investigate empirically in the final section of the paper.

Commodity Returns and Speculative Intensity

The Commodity Futures Trading Commission (CFTC) publishes the weekly aggregate positions of "commercial" and "non-commercial" traders in the Commitment of Traders (CoT) report released each Tuesday. The authors use these long/short futures positions data to compute the Han (2008) index of speculative activity for the eight commodities in the sample. This index is equal to the number of long non-commercial contracts minus the number of short non-commercial contracts, scaled by the total open interest in futures markets for the commodity of interest; as such this is a directional index of speculative activity in the futures market. These indices are adjusted for the effect of the business cycle.

The empirical evidence from regressions estimated by the GMM method (to control for endogeneity in the speculative indices) suggest a positive and significant impact of the Han index on the respective commodity returns for 5 commodities (wheat, soybeans, raw sugar, cotton, live cattle). Negative cross effects between crude oil return and the Han speculative index are found, for instance, in cotton. The empirical evidence suggests that the speculative indices simultaneously impact most commodity returns which provides an explanation to rationalize the strong excess co-movement in the recent decade.

Conclusions

This paper brings new insights on the issue of the excess co-movement of commodity prices. It utilizes large approximate factor models to extract the key common information contained in a large set of macroeconomic variables. The extracted factors can only explain a small part of the excess co-movement. The paper documents a time-varying overall co-movement which has notably magnified post-2008 and provides evidence to suggest that it relates to speculative futures trading activity.

Endnote

1 Wheat, copper, silver, soybeans, raw sugar, cotton, crude oil, live cattle.

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Keywords

Commodity excess co-movement, factor model, futures trading, speculative trading.