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Communication matters: US monetary policy and commodity price volatility

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Communication Matters:
U.S. Monetary Policy and Commodity Price Volatility

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Communication Matters:
U.S. Monetary Policy and Commodity Price Volatility

Abstract

Using a GARCH model, we analyze the influence of U.S. monetary policy action and communication on the price volatility of commodities for the period 1998–2009. We find, first, that U.S. monetary policy events have an economically significant impact on price volatility. Second, expected target rate changes and communications decrease volatility, whereas target rate surprises and unorthodox monetary policy measures increase it. Third, we find a change in reaction to central bank communication during the recent financial crisis: the "calming" effect of communication found for the whole sample is partly offset during that period.

JEL: E52, E58, G14, Q10, Q40

Keywords: Central Bank Communication, Commodities, Federal Reserve Bank, Monetary Policy, Price Volatility

1. Introduction

During the recent financial crisis, many newspapers reported a "flight to gold" (e.g., *The Telegraph*, January 6, 2008). Investors consider gold a safe investment because it is a hard store of value. Thus, in times of financial uncertainty and extraordinary provision of liquidity by many central banks, gold and other commodities are seen as safer investments than stocks, currencies, or other financial products. However, *de facto*, gold prices are almost as volatile as S&P 500 returns.[1] Therefore, one should view gold, or other commodities, as just another asset in an investor's portfolio that is influenced by the same macroeconomic news as are other financial assets. In line with this view, Frankel and Hardouvelis (1985) document a relationship between *monetary policy news* and commodity prices.

Thus, according to Frankel's (1986) theoretical model, we expect news about U.S. monetary policy, such as (unexpected) interest rate changes, to play an important role in commodity prices.[2] Over the past two decades, (informal) communications about the state of the economy and the future course of monetary policy have become useful additions to central bankers' toolkits. To accommodate this development in monetary policy, we also incorporate several communication channels regularly used by Federal Reserve (Fed) officials in our analysis. However, in our dataset, news regarding economic outlook and future monetary policy does not have a clear effect on commodity *returns*.[3] Hence, our analysis focuses only on the *volatility* of commodity prices and we find significant, systematic, and robust volatility reactions to monetary policy over the sample period 1998–2009.

In this paper, we address three research questions. First, do U.S. monetary policy events have an economically significant impact on the price volatility of commodities? Second, if so, do markets react differently to official rate changes versus (informal) communications? Third, is there a different reaction to monetary policy measures during the financial crisis, which began in August 2007, compared to the period before? Extant literature focuses on monetary policy *actions* and commodity *returns*; this is the first study to examine the *price volatility* of commodities using monetary policy *actions* and *communications*.

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[1] During our sample period (1998–2009), the standard deviation of gold (S&P 500) returns is 1.15 (1.37). For both assets, the standard deviation increases considerably during the financial crisis starting on August 7, 2007: gold, 1.62; S&P 500, 2.08.

[2] Empirical evidence for the influence of monetary policy actions on commodity prices is provided (among others) by Frankel and Hardouvelis (1985) and Frankel and Rose (2010). Barsky and Kilian (2004) show that monetary policy stance is useful as a predictor of commodity prices. Finally, Bernanke et al. (1997) illustrate that oil price shocks induce a monetary policy response that can amplify the contractionary effects of the oil price shock itself.

[3] This is in line with the findings of Frankel and Hardouvelis (1985), who also discover a state-dependent reaction of commodity prices to monetary policy news.

The remainder of the paper is organized as follows. Section 2 describes the construction of monetary policy news and presents the econometric methodology. In Section 3, we illustrate our results. Section 4 concludes with the policy implications of our findings.

2. Data and Empirical Methodology

In our analysis, we use a new data set introduced and described in detail in Hayo et al. (2008, 2011). One of the advantages of this data set is that it covers the recent crisis period. The data set contains 837 speeches and 201 congressional hearings by Board of Governors members, as well as 94 post-meeting statements and 26 monetary policy reports (MPR). Our analysis incorporates a subset of these events: only those communications containing information on either the U.S. economic outlook or the Fed's future monetary policy course are included. In addition to these (informal) communications, we also analyze expected target rate changes and target rate change surprises.[4] Finally, we integrate several variables controlling for the unorthodox measures undertaken by the Fed during the financial crisis.[5] Table A1 in the Appendix summarizes the frequency of these events.

Our commodity indicators comprise daily growth rates on five sub-indices of the Goldman Sachs Commodity Index over the period 1998–2009 (2,993 observations): agricultural, energy, livestock, industrial metals, and precious metals.[6] Descriptive statistics show that all series exhibit excess kurtosis, but almost no skewness, indicating volatility clustering (Engle, 1982). Thus, we employ the following GARCH(1,1) specification (Bollerslev, 1986):

$$(1)\ Returns_t = \gamma + \sum_{r=1}^{6} \delta_r\ Control\ Variables_{t-r} + \mu_t,$$

$$\mu_t = \varepsilon_t h_t^{1/2},$$

$$h_t = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \beta_1 h_{t-1} + \zeta\ Monetary\ Policy\ Events,$$

where α_0, α_1, β_1, μ, γ, δ, and ζ are parameters or vectors of parameters and ε_t is independent and identically distributed.

The general specification is an autoregressive-distributed lag model with six lags. The vector of control variables contains past commodity returns as well as returns on three U.S.

[4] Bloomberg surveys are used to identify surprises from scheduled meetings. Intermeeting moves are classified as surprises.

[5] (i) Discount rate change on August 17, 2007, (ii) announcement of joint initiatives with the federal government, (iii) announcement of additional unilateral liquidity actions, (iv) announcement of internationally coordinated liquidity actions, and (v) announcement of measures to mitigate problems in the asset-backed security market.

[6] Data source: Global Financial Indicators.

financial indicators: S&P 500 index, 10-year government bonds, and broad U.S. dollar exchange rate index.[7] The contemporaneous financial returns are omitted to avoid simultaneity problems. (Expected and unexpected) target rate changes, Federal Reserve communications (statements, monetary policy reports, testimony, and speeches), and unorthodox measures are included in the variance equation (h_t) on the day the news actually reaches the respective market. To disentangle the influence of Fed actions and communications during the financial crisis from the ones during "normal times," we create additional interaction variables for the former during the financial crisis.[8]

3. Empirical Results

Table 1 presents the results for the variance part of Equation (1). In general, expected target rate changes and communications decrease volatility, whereas target rate surprises and unorthodox monetary policy measures increase it. The median conditional variances range from 0.82 (precious metals) to 3.93 (energy). Thus, the coefficients for target rate surprises and unorthodox measures are of particular relevance. Nonetheless, all other communication types and expected target rate changes play a noticeable role, too. To summarize, monetary policy actions and communications are important determinants of commodity volatility, a finding new to the literature.

Communication lowers price volatility over the whole sample. This is in line with findings by Hayo et al. (2008), who obtain similar results for U.S. bond and equity markets. They interpret this as an indication of central bankers' role as financial market "psychologists." By communicating with the public, they can calm the market. During the financial crisis, we mostly find a positive interaction effect for the communication variables. This implies that the "calming" effect is partly offset as, apparently, central bank news requires an adjustment of portfolios. However, only in the case of livestock do we find a significantly positive influence.

[7] Day of the week effects are not included as they provide no significant results.

[8] We had two reasons for deciding against separate estimations for pre-crisis and crisis periods and in favor of a nested model. First, we can statistically test for differences across coefficients. Second, the number of observations for each subsample varies considerably (2,392 during normal times; 601 during the crisis).

Table 1: Explaining Price Volatility of Commodities

	Agricultural			Energy			Livestock			Industrial Metals			Precious Metals		
	Coeff.	p-val.		Coeff.	p-val.		Coeff.	p-val.		Coeff.	p-val.		Coeff.	p-val.	
ARCH	**0.062**	**0.00**		**0.053**	**0.00**		**0.065**	**0.00**		**0.156**	**0.00**		**0.062**	**0.01**	
GARCH	**0.506**	**0.00**		**0.893**	**0.00**		**0.889**	**0.00**		**0.371**	**0.00**		**0.903**	**0.00**	
Constant Term	**1.202**	**0.00**		**0.235**	**0.00**		**0.107**	**0.00**		**0.867**	**0.00**		**0.032**	**0.01**	
...Financial Crisis	0.162	0.21	**	–0.041	0.44	**	**–0.043**	**0.01**	**	**0.859**	**0.01**	**	**0.057**	**0.03**	**
Target Rate Moves	**–0.878**	**0.00**		–0.390	0.53		–0.049	0.77		0.082	0.84		0.013	0.92	
…Financial Crisis	–0.976	0.18	**	0.511	0.69		–0.273	0.38		–0.518	0.77		**–0.983**	**0.02**	*
Target Rate Surprises	–0.058	0.86		**6.440**	**0.05**		0.440	0.13		0.169	0.74		0.798	0.38	
…Financial Crisis	**13.111**	**0.01**	*	–5.059	0.21		0.386	0.54		0.737	0.72		1.420	0.44	
Unorthodox Measures	—	—		—	—		—	—		—	—		—	—	
…Financial Crisis	2.653	0.24		**1.637**	**0.02**	*	–0.006	0.96		**3.674**	**0.02**	*	0.463	0.25	
Statements	**–1.086**	**0.00**		0.075	0.89		**–0.334**	**0.01**		–0.548	0.06		0.025	0.84	
…Financial Crisis	0.111	0.88		–0.719	0.47		0.398	0.17		0.597	0.60		0.113	0.79	
Monet. Policy Reports	**–1.399**	**0.00**		**–1.010**	**0.03**		**–0.528**	**0.05**		0.167	0.80		–0.161	0.07	
…Financial Crisis	0.794	0.39		4.743	0.05		0.353	0.38		1.134	0.53		–0.606	0.16	
Testimony	**–0.862**	**0.01**		–0.152	0.80		–0.357	0.06		0.130	0.91		**–0.257**	**0.00**	
…Financial Crisis	1.362	0.35		2.024	0.26		**0.772**	**0.02**		–2.222	0.05	**	0.659	0.12	
Speech	**–1.054**	**0.00**		–0.045	0.85		–0.215	0.16		**–0.537**	**0.00**		–0.010	0.82	
…Financial Crisis	0.450	0.46		–0.219	0.69		0.161	0.39		0.857	0.39		–0.342	0.05	*

Notes: Only the results for the variance part of Equation (1) are shown. Full tables are available on request.
Bold coefficients are significant at the 5% level. Standard errors are heteroscedasticity-consistent.
The first row between each set of lines is the effect over the whole sample period; the "Financial Crisis" row below that shows the interaction effect during the financial crisis.
* (**) indicates joint significance of both coefficients at a 5% (1%) level.

Expected target rate changes also lead to a decline in price volatility. Financial investors apparently see no reason to make large portfolio adjustments if the central bank's interest rate decision matches their expectations. This result holds over the whole sample and during the financial crisis. In contrast, if the interest rate change is higher or lower than expected or implemented at an unscheduled meeting, price volatility increases. This effect is even larger during the financial crisis. Finally, unorthodox measures (such as joint initiatives with the government) result in higher volatility, probably because they increase investor concern about financial stability.

4. Conclusions

Using a GARCH model, we analyze the influence of U.S. monetary policy action and communication on the price volatility of commodities for the period 1998–2009. Our analysis provides answers to three research questions.

First, U.S. monetary policy events do have an economically significant impact on the volatility of commodity prices. Second, expected target rate changes and communications decrease volatility, whereas target rate surprises and unorthodox monetary policy measures increase it. Third, we find a change in reaction to central bank communication during the recent financial crisis: the "calming" effect of communication found for the whole sample is partly offset during that period.

Our results have several interesting implications for investors and policymakers. First, in addition to observing formal announcements, investors would do well to pay attention to informal communication of U.S. monetary policy. These informal communications are used to prepare financial markets for upcoming interest rate changes and thus have an influence on those markets. Second, policymakers interested in decreasing the volatility of markets should increase the frequency of their communications. Timely and appropriate communication can lessen the impact, or deter altogether, monetary policy surprises, which increase volatility. Third, the diminished influence of communication during the financial crisis suggests that the usual "calming" effect of communication was weaker during that period. Apparently, it was more difficult for central bankers to convince investors that their actions would be effective during the financial crisis. Finally, we find that monetary policy has a larger risk effect on commodity markets than wealth effects. Thus, when building optimal asset portfolios, investors need to be aware that commodities are not necessarily a safe investment. Our evidence suggests that even tangible assets with a hard store of value, such as commodities, are subject to fluctuations in financial markets. Given that the volatility reaction of

commodities to monetary policy action and communication is similar to that of other financial markets, for instance, bonds or stock markets, the potential to reduce portfolio risk by including such assets as a means of diversification may be limited.

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Appendix

Table A1: Frequency of Monetary Policy Events

	Overall Sample	**Financial Crisis**
Target Rate Moves	49	10
Target Rate Surprises	13	5
Unorthodox Measures	33	33
Statements	76	21
Monetary Policy Reports	26	4
Testimony	35	14
Speeches	150	27

Note: The "Overall Sample" column shows the number of events during the sample period 1998–2009; the "Financial Crisis" column gives the frequency during the subsample starting on August 7, 2007.