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World Commodity Prices as a Forecasting Tool for Retail Prices: Evidence From the United Kingdom

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Abstract

This paper investigates, using cointegration and Granger-causality techniques, whether a stable long-run co-movement exists between world commodity prices and U.K. retail prices, and whether short-run changes in commodity prices convey information about future movements in U.K. retail prices. The results show noncointegration and no unidirectional Granger causality from commodity to retail prices. These findings suggest that little may be gained from using developments in commodity prices to forecast movements in retail prices in the inflation-targeting framework followed by the U.K. monetary authorities.

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Contents **Page**

SUMMARY

During the 1990s, several countries have adopted a monetary policy framework based on explicit inflation targets. The U.K. authorities introduced an inflation target in September 1992, following the exit of the sterling from the ERM, on the basis of inflation projections published quarterly. Among the information variables taken into account by the Bank of England in assessing the inflation outlook are developments in world commodity prices.

While the literature gives several economic reasons for using world commodity prices as a guide for monetary policy, other authors have highlighted their weaknesses, such as their inherent volatility. The empirical evidence, conducted mainly for the United States, is mixed. Although some authors find evidence in favor of using world commodity prices as a monetary policy tool, others find a relationship but no intertemporal causation. More recent studies do not seem to find a clear and reliable relationship between commodity and retail prices.

In the context of the United Kingdom new monetary framework of inflation targeting, this paper investigates whether world commodity prices may be a useful forecasting tool for inflation in the United Kingdom. Using cointegration and Granger-causality techniques, the paper assesses whether a stable long-run co-movement exists between world commodity prices and United Kingdom retail prices, and whether short-run changes in world commodity prices convey information about future movements in United Kingdom retail prices. The results show noncointegration and no unidirectional Granger causality from commodity to retail prices. These findings suggest that the United Kingdom monetary authorities may have little to gain from using developments in commodity prices to forecast movements in retail prices in the inflation targeting framework they are currently following.

I. INTRODUCTION

During the 1990s, several countries have a monetary policy framework based on explicit inflation targets. Two main factors underlay the change. First, there was widespread acceptance that price stability should be the primary objective of monetary policy. This follows from the proposition that in the long-run the level of real economic activity is neutral with respect to monetary policy so that, in equilibrium, the most that monetary policy can achieve is a desired rate of inflation or price level. Second, there was disillusionment with monetary aggregates as a nominal anchor, and problems in maintaining an exchange rate peg.[2] Because the end-product of monetary policy actions are inflation outcomes, countries with inflation targets are often said to pursue "final target" strategies. However, final target approaches do not mean that intermediate variables are not necessary. In the U.K., inflation was introduced as final target of monetary policy in September 1992, following the exit of the sterling from the European Exchange Rate Mechanism (ERM), and was accompanied by the Bank of England's inflation projection published quarterly in the *Inflation Report*.[3] The inflation projection in the *Inflation Report* offers an early warning indicator of inflationary pressures. It is actively used as an intermediate variable, or more generally as a guidepost for monetary policy decisions.[4] Among the information variables taken into account by the Bank of England in assessing the inflation outlook are developments in world commodity prices. This paper investigates, using cointegration and Granger-causality techniques, whether a stable long-run comovement exists between different world commodity price indices and whether short-run changes in commodity prices convey information about future movements in U.K. retail prices. The results suggest that little may be gained by using developments in commodity prices to forecast movements in retail prices in the inflation targeting framework, either in the long or the short-run.

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[2] Hook and Walton (1989) and Hendry and Ericsson (1991) have suggested several reasons for the unreliability of the monetary variables as intermediate targets of monetary policy in the U.K. context.

[3]Until very recently, June 6, 1997, the Chancellor was formally responsible for setting interest rates but, practically speaking, the monetary authorities had already moved to the inflation targeting framework.

[4] In this regard it may be too early to determine whether the Bank of England's inflation projection satisfies the usual criteria for an intermediate target variable. While the forecast is accurately measurable and readily available; it remains to be seen how reliable is its relationship with the government's policy instruments, and with the ultimate goal of monetary policy, controlling inflation. (See Haldane, 1995).

II. Commodity Prices as an Information Variable

Four principal economic reasons have been advanced for using commodity price developments as a leading indicator of retail price developments in industrial countries. First, commodity prices and retail prices are linked directly because commodities are an important input into production. Thus, other things being equal, increases in commodity prices should be reflected in higher prices for final goods. Second, commodity prices are established in flexible "auction" markets that respond quickly to "news" about future inflation prospects, whereas other consumer prices are set by sellers and adjusted only gradually. Provided that conditions in commodity prices reflect aggregate supply and demand in the whole economy, an increase in aggregate demand--which might eventually translate into higher inflation--should be expected to show up much earlier in commodity prices.[5] Also, in the case in which commodity prices rose simultaneously with final good prices, inflationary pressures would be observed first in commodity price indices since they are updated almost immediately whereas retail price indices are reported with a lag of several weeks. Third, commodity prices have forward looking characteristics, arising from their storability. Hence, commodity stocks, and claims on them which are traded in future markets, should be similar to financial assets as regards the sensitivity of their prices to expectations of future economic conditions.[6] Finally, if commodity prices respond quickly to general inflationary pressures, investors may view them as a useful hedge against higher inflation. This function appears to have been performed most often with gold.

Other authors have highlighted the potential weaknesses of commodity prices as an indicator of general price developments. Commodity prices are inherently volatile. Even well-diversified indices exhibit inflation variances (or standard deviations) that are many times that of the Consumer Price Index. Under a commodity price rule, monetary policy might transmit this volatility to the real economy via the credit markets, implying that the elimination of the inflationary bias would be achieved at the expense of greater short-run instability in the level of aggregate economic activity. Another potential drawback is that supply conditions in commodity prices can deviate significantly from aggregate demand in an individual economy. Finally, movements in non-commodity costs, particularly labour costs, may dominate as regards the impact of commodity prices on current prices.

A number of empirical studies have been conducted to examine the relationship between commodity prices and general price developments, to assess whether there is a role for commodity prices in the formulation of monetary policy. The empirical evidence is mixed.

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[5] This distinction is emphasized, for example, by Bosworth and Lawrence (1982) and Beckerman and Jenkinson (1986).

[6] Van Duyne (1979) and Frankel and Hardouvelis (1983) have emphasized this assets characteristic of commodities.

Hall (1982) and Marquis and Cunningham (1990) argue in favor of basing US monetary policy on a commodity standard with the commodities chosen on the basis of their historical fit against the cost of living. Cody and Mills (1990) find evidence, based on a structural VAR model, in favor of a commodity-price-based monetary policy in the United States. Durand and Blondal (1988) find evidence of a relationship between commodity and general prices but cannot find intertemporal causation. Garner (1989), Sephton (1988) and Boughton and Branson (1988) find no reliable long-run relationship between commodity prices and retail prices but suggest that commodity prices provide a useful information about inflation in the short-run. Finally, Blomberg and Harris (1995) find that even the short-run signaling power of commodity prices has been diminishing over time. In the case of the United Kingdom, empirical literature on the role of commodity prices in the conduct of monetary policy is limited but generally draws conclusions similar to the literature on the United States. Thus, Fraser and Rogers (1992) show that the use of commodity prices as intermediate control variable is difficult to justify empirically, although there may be some gains from using commodity prices as a leading indicator of future inflation when monetary variable are unreliable. Our results are less optimistic in that regard: we find no stable long-run relationship between commodity prices and U.K. retail prices, and hardly any evidence of causality from commodity prices to retail prices.

III. METHODOLOGY

We use the familiar three step methodology for cointegration. The first step is test the order of integration of the natural logarithm of the levels of the retail and commodity prices series by computing the augmented Dickey-Fuller (ADF) test statistics. Conditional upon the outcome, the second step is to test for cointegration of the price series. Since we are dealing with pairs of series (the retail price index and a commodity price index) so that only one cointegrating vector is possible, the Engle and Granger (1987) residual based cointegration testing procedure is the most straightforward and appropriate. If cointegration exists, then either uni-directional or bi-directional Granger-causality must exist in at least the I(0) variables. The test for cointegration uses the regression equation:

$$RPIX_{uk} = \alpha + \Omega CP_{w} + \varepsilon \qquad (1)$$

where $RPIX_{uk}$ and CP_{U} are the U.K. retail price index excluding mortgage interest payments and world commodity prices, respectively.

The third step is to carry out a standard Granger causality test augmented with an appropriate error-correction term derived from the long-run cointegrating relationship in equation (1). Assuming the levels of the interest rate series are I(1) and cointegrated, the appropriate formulation of a Granger-type test of causality, which must be applied to the stationary series, is:

$$\Delta RPIX_{ukt} = \alpha_0 + EC_{t-i} + \sum_{i=1}^{n} \beta_i \Delta RPIX_{ukt-i} + \sum_{i=1}^{n} \delta_i \Delta CP_{wt-i} + \varepsilon_t, \quad (2)$$

$$\Delta CP_{wt} = \alpha_0 + EC_{t-i} + \sum_{i=1}^{n} \Phi_i \Delta CP_{wt-i} + \sum_{i=1}^{n} \phi_i \Delta RPIX_{ukt-i} + \mu_t \quad (3)$$

where Δ is the difference operator, $RPIX_{uk}$ and CP_w are as previously defined, EC_{t-i} is the error-correction term derived from the long-run cointegrating relationship, and ε_t and μ_t are zero-mean, serially uncorrelated random error terms. In equation (2) causality implies CP_w "Granger-causing" $RPIX_{uk}$ provided that some δ_i is not zero. Similarly, in Equation (3) $RPIX_{uk}$ is "Granger-causing" CP_w if some ϕ_i is not zero. Inclusion of the error correction term introduces an additional channel through which Granger-causality can be detected. According to Granger (1988), independent variables "cause" the dependent variable either if the error-correction term carries a significant coefficient or the first difference independent variables are jointly significant. Note that if RPIX and the respective commodity price index are not cointegrated, then the error-correction term is dropped from equations (2) and (3) in the Granger-causality tests. To implement the Granger-causality test, F-statistics are calculated under the null hypothesis that all the coefficients of δ_i, and ϕ_i, respectively, equal zero. As the results from Granger-causality tests are sensitive to the selection of lag length, results are presented from equations using the minimum final prediction error (FPE) criterion suggested by Akaike (1969) to determine the appropriate lag length. Finally, we test for the structural stability of the coefficients in equations (2) and (3) by breaking the sample period at 1992Q2, the eve the United Kingdom's exit from the ERM and the subsequent adoption of an inflation target by the monetary authorities.

IV. Data and Results

Our empirical analysis is based on quarterly data for the period 1980Q-1996Q4. The United Kingdom's inflation target is defined in terms of movements retail prices excluding mortgage interest payments (RPIX).[7] Two sources for US dollar world commodity prices are used: the series produced by The Economist magazine and those produced by

[7] However, the U.K. authorities also monitor a range of inflation indices when assessing underlying inflationary pressures.

UNCTAD.[8] The Economist produces six series: all commodity prices (ALL); food product prices (FOOD); industrial product prices (IND); nonfood agricultural product prices (NFAG); metal prices (METAL); and the world gold price (GOLD). The series from UNCTAD are: total commodity prices (TOTAL); total commodity prices less oil (TOTALO), food and beverage products (F&B); agricultural raw materials (ARM); minerals and metals (M&M); and world oil prices (OIL). In addition, we examine the long- and short-run relation between the US dollar gold price (GOLD) and U.K. retail prices.[9] We examine the relationship between US dollar commodity price indices and developments in U.K. inflation to try to abstract from exchange rate effects on U.K. retail prices.[10]

Table 1 presents ADF test statistics for the log levels and first differences of the price series. From the results, the null hypothesis that the levels of the series contain unit roots cannot be rejected for all series with the exception of gold; however, on first-differenced data the results reject the hypothesis of a unit root in the remaining cases --i.e. in level form the price series are I(1) but in first difference form they are I(0) with the exception of the gold price. The Engel-Granger cointegration test results for the retail price index paired with each commodity price index (excluding the gold price series) are shown in Table 2. The hypothesis of a single cointegrating vector is rejected at the 5 per cent level in all cases. There are at least three plausible explanations for this finding. One is the long-run secular trend in real commodity prices identified in several recent studies (e.g. Reinhart and Wickham 1994, Boughton 1991, Grilli and Yang 1988) which has been almost continuous since the early 1980s.[11] A second is the that the stochastic, permanent relative price changes between retail prices and commodity prices are associated with the dynamics of a third (or more) variable that, when taken into

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[8] The series differ with respect to the weights attached to the various components. By broad commodity group these are (per cent):

	The Economist index	UNCTAD index
Metals	33.3	2.2
Fuels	--	23.6
Nonfood agriculture	19.3	24.9
Foodtuffs	47.4	49.3

[9] The series for U.K. retail prices and for UNCTAD commodity prices are from the OECD database, the commodity price indices published by The Economist and the world gold price are from the Datastream database.

[10] Nonetheless, text were made converting the commodity price series to sterling but similar results were found.

[11] According to Reinhart and Wickham (1994), for example, in 1992 real commodity prices reached their lowest levels in over 90 years.

account, forms a multivariate cointegrated system with the retail price index and the respective commodity price index.[12]

Table 1. Unit Root Tests: Augmented Dickey-Fuller (ADF) Statistics

Variable	Level	First Difference
(a) General price Indices		
RPIX	-0.8633	-2.9833*
GOLD	-4.5141	--
(b) The Economist commodity price indices		
ALL	-2.2790	-4.4349**
FOOD	-2.7963	-5.3248**
IND	-1.9580	-4.8291**
NFAG	-1.9704	-4.1619
METAL	-2.5010	-3.5804
(c) UNCTAD commodity price indices		
TOTAL	-1.9683	-4.5298
TOTALO	-2.6905	-3.6694
F&B	-2.8987	-3.9246
ARM	-1.8837	-3.5509
M&M	-1.9880	-3.2462
OIL	-1.6929	-4.5557

Notes: The ADF test is based on the regression:

$$\Delta x_t = \alpha_0 + \alpha_1 x_{t-1} + \sum_{i=1}^{n} \mu_i \Delta x_{t-i} + \varepsilon_t$$

where D is the difference operator and e is a stationary random error. Sufficient lags

[12]In this regard, a different approach could be followed to assess the relevance of worldwide commodity prices on retail prices. A price determination model could be set up equalizing costs, plus a mark-up, to prices. Commodity prices would then be considered one of the costs. This type of approach could be an interesting topic for further research given the increased importance of finding reliable indicators of the price level in the new U.K. inflation targeting framework followed by the U.K. monetary authorities.

were included to eliminate serial correlation. The critical values at the 1 percent and 5 percent levels, respectively, are about -3.53 and -2.91.

Table 2. Test Results for Engel-Granger Cointegration

X_1, X_2	X_1 Dependent	X_2 Dependent
(a) The Economist commodity price indices		
RPIX, ALL	-1.2638	-3.2907
PRIX, FOOD	-0.1250	-2.9731
RPIX, IND	-1.4840	-3.2536
RPIX, NFAG	-2.4052	-3.3146
RPIX, METAL	-0.0988	-2.8443
(b) UNCTAD commodity price indices		
RPIX, TOTAL	-0.5598	-1.7547
RPIX, TOTALO	-0.6187	-2.8851
PRIX, F&B	-0.8400	-2.5994
RPIX, ARM	-1.5580	-2.6426
RPIX, M&M	-1.6218	-2.5323
RPIX, OIL	-0.8158	-1.7773

The critical value for a 4th order ADF test is about -3.44.

A third possible explanation for the lack of a cointegrating relationship is suggested by Blomberg and Harris (1995). They argue that a decline in the commodity content of output, reflecting a shift in final demand away from goods with a high commodity content (such as food, beverages and tobacco, and energy) towards sectors with a low commodity content (such as services), accounts for the diminished signaling power of commodity prices. In the United Kingdom, it does appear that the commodity content of final output has fallen markedly. For example, over 1980-96 the share of food, beverages and tobacco, and rent fuel and power in real private consumption expenditure declined from 28 percent to about 19 percent, and 21 percent to 19 percent, respectively, while the share of services rose from 41 percent to about 45 percent. The reduced share of commodities in final output means that a rise in commodity prices is more likely to reflect an increase in a narrow part of final demand than an increase in aggregate demand.

Thus, the cointegration results, which are broadly in line with those from the US studies, suggest that developments in US dollar commodity prices are not be a useful indicator for the U.K. monetary authorities to focus on to target for retail price inflation.

Causality test results from estimates of equations (2) and (3) are presented in Table 3. The results give no indication of unidirectional causality from commodity prices to U.K. retail prices; in contrast, there is unidirectional causality from the U.K. retail price index to several commodity price indices -- ALL, IND, NFAG, and METAL in the case of The Economist series, and TOTALO, F&B, and ARM in the case of the UNCTAD series.[13] This would appear to suggest that retail prices are a much better indicator of general demand pressures than are world commodity prices. Also reported in Table 3 is the Chow F-statistic to test for stability of the coefficients following the adoption of inflation targets in September 1992; in each case the statistic is consistent with no structural change in the coefficients of the short-run equations.[14]

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[13] These results are in sharp contrast to those of the U.S. studies. For example, Sephton (1991) found unidirectional Granger-causality from commodity prices to U.S. retail prices in all cases except gold.

[14] Structural change may have occurred with the adoption of inflation targets as a result of the Bank of England incorporating commodity price developments into the inflation projection and taking offsetting policy action.

Table 3. Granger-Causality Test Results

Causality	FPE Lags	F-Statistic	Chow-Statistic[1]
(a) The Economist commodity price indices			
ΔALL→ΔRPIX	5,1	0.0639	1.0248
ΔFOOD→ΔRPIX	5,1	0.3854	1.0836
ΔIND→ΔRPIX	5,1	0.0191	0.9680
ΔNFAG→ΔRPIX	5,1	0.0828	1.0659
ΔMETAL→ΔRPIX	5,1	0.0035	1.0044
ΔRPIX→ΔALL	1,2	4.5633*	0.6185
ΔRPIX→ΔFOOD	1,2	1.5580	0.6120
ΔRPIX→ΔIND	1,1	5.3298**	0.5819
ΔRPIX→ΔNFAG	1,2	8.4904**	1.8096
RPIX→ΔMETAL	1,1	4.5990*	0.9932
(b) UNCTAD commodity price indices			
ΔTOTAL→ΔRPIX	5,1	0.0016	1.0201
ΔTOTALO→ΔRPIX	5,1	0.0023	1.0542
ΔF&B→ΔRPIX	5,1	1.0186	1.0862
ΔARM→ΔRPIX	5,1	0.0770	0.9795
ΔMM→ΔRPIX	5,1	0.3499	1.0226
ΔOIL→ΔRPIX	5,1	0.0047	1.0142
ΔRPIX→ΔTOTAL	1,2	1.4718	0.8998
ΔRPIX→ΔTOTALO	1,1	4.5488**	0.7055
ΔRPIX→ΔF&B	1,1	7.5753**	0.3290
RPIX→ΔARM	1,2	4.1192**	0.3364
ΔRPIX→ΔM&M	1,1	1.0552	0.7199
RPIX→ΔOIL	1,2	2.7781	1.0458
(c) The gold price index			
ΔGOLD→ΔRPIX	5,1	0.5677	0.9580
ΔRPIX→ΔGOLD	1,1	4.4936*	1.1149

[1]Chow F-test statistic for the structural stability of the coefficients; series break is at 1992Q2.

** and * indicate statistical significance at the 1 per cent and 5 per cent levels, respectively.

V. Conclusion

This note has used cointegration and Granger-causality techniques to investigate whether there exist long-run comovements between world commodity prices and U.K. retail prices, and whether short-run movements in commodity prices convey information about short-run movements in U.K. retail prices. The results show noncointegration of world commodity prices with U.K. retail prices, and no unidirectional Granger-causality from commodity to retail prices. These findings may reflect the secular decline in world commodity prices, the shift in final demand in the United Kingdom towards goods with a low commodity content, and the retail prices being a better indicator of demand pressures than world commodity prices. Thus, there appears to be little advantage in using developments in commodity prices to forecast movements in retail prices within the new inflation targeting framework followed by the U.K. monetary authorities.

REFERENCES

Akaike, H., 1969, "Fitting Autoregressive Models for Prediction," Annals of the Institute of Statistical Mathematics 21, 243-47.

Beckermann, W. and T. Jenkinson, 1986, What Stopped the Inflation: Unemployment or Commodity Prices,?" Economic Journal 96, 39-54.

Blomberg, S. Brock and Ethan S. Harris, 1995, "The Commodity-Consumer Price Connection: Fact or Fable?" Economic Policy Review 1, Federal Reserve Bank of New York, 21-38.

Bosworth, B.P. and R. Lawrence, 1982, Commodity Prices and the New Inflation, Washington D.C.: The Brookings Institution.

Boughton, J.M. and W.H. Branson,1988, "Commodity Prices as a Leading Indicator of Inflation," IMF Working Paper WP/88/87.

Boughton, J.M.,1991, "Commodity and Manufactures Prices in the Long Run", IMF Working Paper WP/88/87.

Cody, B. and L. O. Mills, 1990, "The Role of Commodity Prices in Formulating Monetary Policy", Federal Reserve Bank of Philadelphia Working Paper 90.

Durand, M. and S. Blondal, 1988, "Are Commodity prices Leading Indicators of OECD Prices", OECD, Department of Economics Working Paper 49.

Engle, R.F., and C.W.J. Granger, 1987, "Co-integration and Error Correction: Representation, Estimation, and Testing", Econometrica 55, 251-76.

Frenkel, J.A and G.A. Hardouvelis, 1983, "Commodity Prices, Overshooting, Money Surprises and Federal Credibility", NBER Working Paper 1121.

Fraser, P. and C. Rogers, 1992, "Some Evidence of the Potential Role of Commodity Prices in the Formulation of Monetary Policy", The Manchester School 60, 377-89.

Garner, Alan C.,1989, "Commodity Prices: Policy Target of Information Variable?", Journal of Money, Credit and Banking 21, 508-14.

Granger, C.W.J.,1988, "Some Recent Developments in the Concept of Causality", Journal of Econometrics 39, 199-211.

Grilli, E.R., and M.C. Yang, 1988, "Primary Commodity Prices, Manufactured Goods Prices, and the Terms of Trade of Developing Countries: What the Long Run Shows", World Bank Economic Review 2, 1- 47.

Haldane, A., 1995, "Inflation Targets", Bank of England Quarterly Bulletin 35, 250-59.

Hall, R.E., 1982, Inflation: Causes and Effects, Chicago: The University of Chicago Press.

Hendry, D. and N. Ericsson, 1991, "Modeling the Demand for Narrow Money in the United States and the United Kingdom", European Economic Review 35, 833-86.

Hook, A. and D. Walton, 1989, "Commodity Price Indicators: A Case for Discretion Rather than Rules" in Blueprints for Exchange Rate Management, London: Academic Press Limited.

Kaldor, N., 1976, "Inflation and Recession in the World Economy", Economic Journal 86, 703-714.

Marquis, Milton H., and Steven R. Cuningham, 1990, "Is There a Role for Commodity Prices in the Design of Monetary Policy? Some Empirical Evidence," Southern Economic Journal, Vol. 57, October, pp 394-412.

Reinhart, C.M. and P. Wickam, 1994, "Commodity Prices: Cyclical Weakness or Secular Decline", Staff Papers, International Monetary Fund 41, 236-61.

Sephton, P.S., 1991, "Commodity Prices: Policy Target or Information Variable", Journal of Money, Credit and Banking 23, 260-66.

Surrey, M.J.C., 1989, "Money, Commodity Prices and Inflation: Some Simple Tests", Oxford Bulletin of Economics and Statistics 32, 179-97.

Van Duyne, C., 1979, "The Macroeconomic Effects of Commodity Market Disruptions in Open Economies", Journal of International Economics 9, 559-82.