

Commodity Prices in the Current Recovery

In the first eight quarters of this expansion non-oil commodity prices rose only about 6½ percent according to the International Monetary Fund (IMF) commodity price index, less than one quarter of the average gain over comparable expansion periods in the 1970s. In the second half of 1984 these prices actually fell 6½ percent, an unusually large decline so early in an expansion. This price weakness has generated some concern that commodity price behavior has shifted relative to the past and may be signalling the onset of deflation in both finished goods prices as well as in primary commodity prices.

This article argues that non-oil commodity price movements have, in fact, been consistent with the behavior of their underlying determinants, despite the volatility of commodity prices throughout this expansion. Specifically, the factors behind the relative overall weakness in this expansion are lower inflation in the industrial countries, and, to a lesser extent, the stronger dollar.¹ For the second half of 1984, several of the same factors, but in much different proportions, lie behind the fall in commodity prices. The steep rise in the dollar and unexpectedly good overall agricultural harvests provided the main impetus to the decline, with slowing output growth and continued declines in inflation adding some downward pressure. Together these short-term economic and agricultural factors explain almost all of this expansion's movements in commodity prices, leaving

little basis from which to conclude that commodity prices are either signalling or causing any impending deflation.

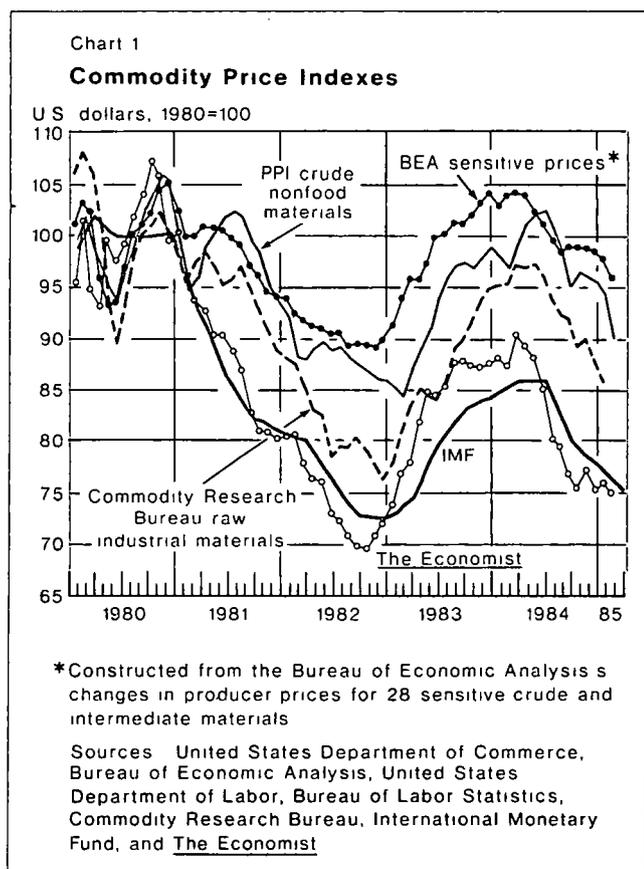
In what follows below, the recent behavior of commodity prices is first placed into a cyclical and longer term context. Then follows a detailed analysis of the determinants of commodity price behavior in this expansion. The article closes with a brief discussion of the medium-term price prospects for a few important commodities.

Recent commodity price movements in perspective

Although the composition and weighting of commodity price indexes varies greatly, all indexes with prices measured in U.S. dollars have displayed similar movements since 1980 (Chart 1).² The severe 1981-82 recession lowered commodity prices 10-35 percent, but all or most of those declines were reversed during the initial stages of the current expansion. By mid-1984 all the indexes began to decline sharply once again, with prices 5-15 percent lower at the end of 1984 than at the peak reached during this expansion. The food, beverages, metals, and non-food agricultural materials subcategories all peaked close to or during the first half of 1984. Although commodity prices have tended to move broadly together in the past, their recent correspondence—both across the various indexes and their internal subcategories—has been stronger than usual.

¹More stable coffee production in this expansion is a major factor in the indexes which include coffee prices. Severe frost damage led to a 400 percent increase in coffee prices from 1975-1 to 1977-1.

²Appendix 2 presents the composition and weighting of the indexes. The discussion in the text focuses primarily on the IMF commodity price index which is a broadly based index of internationally priced commodities, weighted by their share in non-oil commodity exports to 98 non-industrialized countries.



The attention given to commodity prices has focused mainly on their post 1980 weakness and, particularly, on their plunge in the second half of 1984. Such a narrow focus ignores three factors which must be balanced against this picture of apparent weakness. First, prior to the decline in mid- and late-1984, commodity prices in this expansion had risen at a nearly record pace. Second, in both nominal and real terms, 1980 commodity prices (against which most comparisons are made) were unusually high relative to post-war trends. Third, much of the weakness in commodity prices, particularly in 1984, disappears when the indexes are adjusted for the appreciation of the dollar.

The features which distinguish commodity price behavior in this expansion include not only the weakness in the second half of 1984, but also the strength shown in the first stages of this expansion. During the initial five quarters, commodity prices grew extremely rapidly, even when compared to expansions in the 1970s (Table 1). With record or near-record gains relative to earlier expansions, some analysts at the beginning of 1984 were even predicting a strong

resurgence of inflation at least partially on this basis. The gains were also broadly distributed across commodity categories. Unlike the 1975 expansion, for example, both food and nonfood items advanced rapidly.

Over the next few quarters, however, commodity prices fell sharply enough to reduce the cyclical gains to well below 1970s levels (Table 2). Such drops had occasionally occurred in one index or another in earlier expansions, but never as early and never in all simultaneously. Thus, both the breadth and the steepness of the 1984 decline were unusual.

The drop in commodity prices has been even more pronounced in real terms, notwithstanding widespread disinflation in industrial countries. Relative to the overall U.S. Producer Price Index (PPI), for example, the IMF index is about 35 percent lower than in 1980 as compared to about 25 percent in nominal terms (Chart 2).

But a longer-term perspective suggests that the post-1980 declines may be restoring more normal relationships between the prices of commodities and those of manufactured goods. Much attention was paid to the energy price rise of the 1970s, but other commodity prices also rose very sharply in the 1970s and remained high in historical terms through 1980 (Chart 3).³ In fact, between 1948 and the early 1970s real commodity prices had been drifting downward by about 10 percent per decade, just as manufactured goods prices were drifting downward relative to the overall prices of goods and services. Compared to these earlier trends, current real commodity prices—at levels of about 80 percent of the 1961-68 average—do not appear very weak.

Of course, this is not to say that the precipitous drop in real prices since 1980 has not had significant effects on primary commodity producers, or that one should give undue weight to extrapolations which are based on only twenty years or so of data. Judgments about the 'natural' or equilibrium levels of real prices are highly speculative. However, one would expect that a persistent period of relatively high real prices would induce medium- and long-term efforts at capacity expansion among producers and efforts at conservation among consumers. And with such forces already in place, commodity prices were likely to have been especially sensitive to the fall in demand caused by the weak growth of the early 1980s.⁴ Thus, one can argue that some correction to the high real prices of the 1970s was probably inevitable.

³The World Bank's price index of 33 non-energy commodities is used as it is the longest series available on internationally-traded commodities.

⁴Correspondingly, if weak prices persist for another few years, there is some risk of an upsurge in prices should demand conditions suddenly tighten in the late 1980s.

Table 1

Commodity Prices Five Quarters into Expansion

(Trough = 100)

Index	1958-II	1961-I	1970-IV	Expansion Beginning	
				1975-I	1982-IV
IMF					
All commodities	99.1	98.3	106.0	103.8	119.6
Non-food, non-beverage commodities	106.3	98.6	106.7	112.2	114.6
Commodity Research Bureau					
All commodities	101.7	96.7	103.0	101.1	122.6
Raw industrial materials	114.4	97.3	105.0	112.0	123.7
BEA sensitive materials prices	109.5	99.3	109.3	113.9	115.2
BEA producer prices for 28 sensitive crude and intermediate materials	110.2	100.3	115.2	120.3	116.4

Sources: International Monetary Fund, Commodity Research Bureau, Department of Commerce, Bureau of Economic Analysis

Table 2

Commodity Prices Eight Quarters into Expansion

(Trough = 100)

Index	1958-II	1961-I	1970-IV	Expansion Beginning	
				1975-I	1982-IV
IMF					
All commodities	100.6	101.0	121.8	134.5	106.4
Non-food, non-beverage commodities	112.2	98.2	119.3	122.9	103.8
Commodity Research Bureau					
All commodities	100.7	95.4	116.6	105.5	116.1
Raw industrial materials	113.9	95.1	121.5	119.5	114.9
BEA sensitive materials prices	107.0	98.4	120.2	121.6	110.2
BEA producer prices for 28 sensitive crude and intermediate materials	105.7	99.8	127.2	131.4	111.4

Sources: International Monetary Fund, Commodity Research Bureau, Department of Commerce, Bureau of Economic Analysis

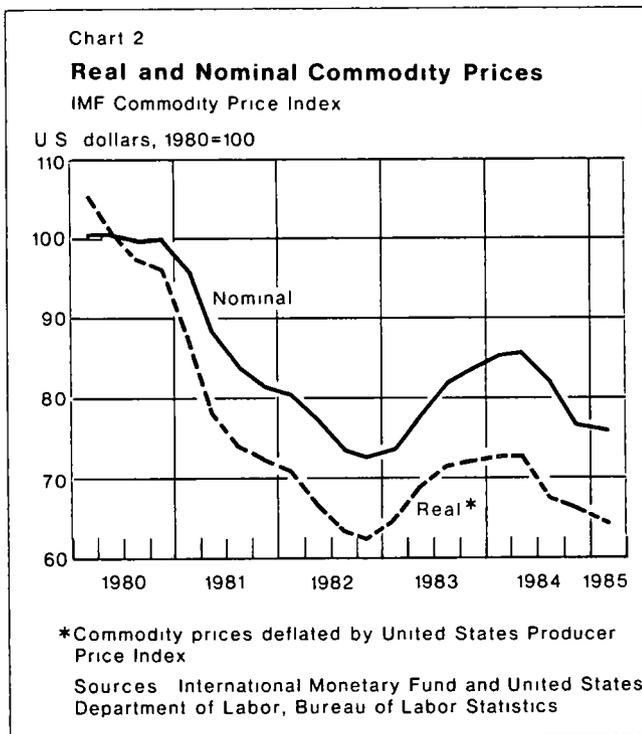
Table 3

Commodity Price Increases During First Two Years of Expansion: 1982 vs. 1975

(Percent change)

Increase in IMF commodity price index	First eight quarters of		Difference
	1982 expansion	1975 expansion	
Actual	6.4	34.5	-28.1
Predicted	6.6	35.5	-28.9
Slowing attributable to *			
(In percent)			
Inflation			44
Value of the dollar			18
Interest rates			1
Coffee production			56
Industrial production growth			-20

*Positive value indicates contribution to slowing of commodity price growth

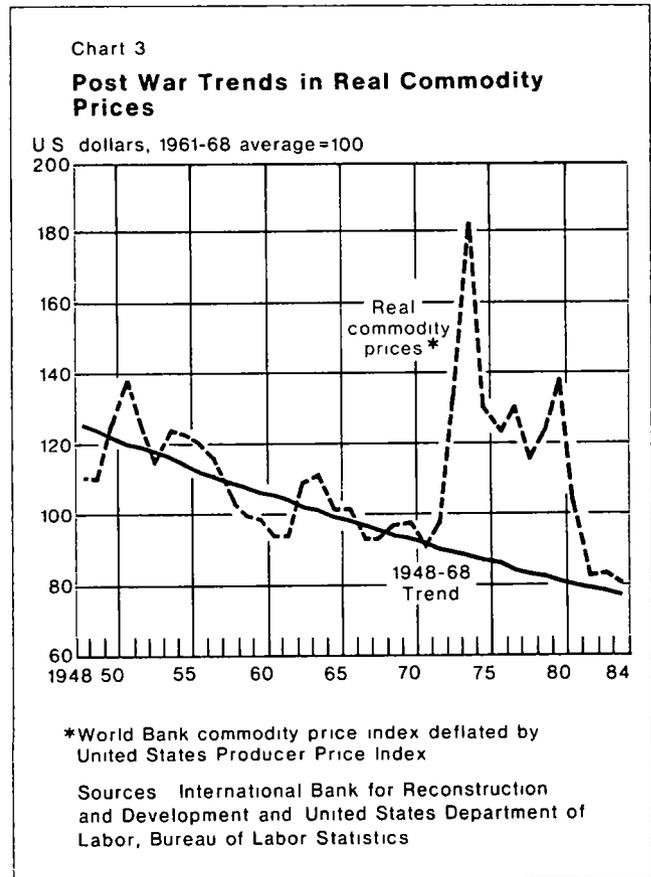


The weakness in commodity prices is also much less apparent when prices are measured in Special Drawing Right (SDR) terms or in foreign currencies, rather than in U S dollars (Chart 4)⁵ In SDR terms and in European currencies commodity prices are currently higher than in 1980. The 8.3 percent drop in US dollar terms over 1984 translates into only a 2.5 percent decline in SDR terms. In most European currencies, commodity prices actually increased in 1984 and, in the cases of the pound and other weak currencies, significantly so. Even with respect to the yen, which has been the strongest major currency relative to the U S dollar since 1980, the recent decline in commodity prices has been comparatively modest.

Explaining recent commodity price behavior

Fluctuations in economic activity, exchange rates, and general price inflation are obviously key factors in determining commodity prices, but their quantitative significance in explaining recent movements remains a question. Given the past relationship between these

⁵The Special Drawing Right is a basket of currencies with the relative weight of each currency based on the country's exports of goods and services. The composition and weights are adjusted periodically. Since 1981, the currencies and weights are the U S dollar (42 percent), Deutsche mark (19 percent), French franc (13 percent), Japanese yen (13 percent), and British pound (13 percent).



economic factors and commodity prices, should we have expected either the weak gains in this expansion relative to the 1975 expansion or the 1984 fall in commodity prices? The analysis presented here leads to the conclusion that the historical relationship has actually held up very well, and that commodity price movements are largely explained by the fact that their determinants, economic and agricultural, have shown wide swings in this expansion.

Econometric analysis

The effects of output growth, inflation and the exchange rate on five commodity price indexes were assessed with econometric equations (Appendix 1).⁶ In general, the results were very similar for each index and suggest that commodity price growth speeds up by just over two percentage points for every percentage point gain in either industrial production or inflation in the six major industrial countries (United States, Japan, West Ger-

⁶The specification is adapted from one developed at the IMF. See Ke-Young Chu and Thomas K. Morrison, "The 1981-82 Recession and Non-Oil Primary Commodity Prices", IMF Staff Papers, March 1984.

many, France, Italy, United Kingdom) A one percent increase in the trade-weighted value of the U S dollar will lower commodity prices by about one percent Direct effects from interest rate movements are much smaller and seem to have little influence Several of the estimates also explicitly include a variable to reflect fluctuations in coffee production, which can at times exert major effects⁷ In general, all these findings are in line with earlier studies

These results are used to study price gains in the first two years of both the 1975 and the current expansions⁸ As might be expected, given the overall volatility of commodity prices, the predictive ability of the equation can be erratic on a quarterly basis However, it tracks surprisingly well over longer spans (Table 3) Indeed, the increases in commodity prices in the first two years of both expansions are almost entirely explained by output growth, inflation, the exchange rate, and coffee production

Coffee production differentiates the two most significantly, accounting for about half of this expansion's weakness relative to 1975⁹ But even after eliminating the effect of coffee, this expansion's gains are still about 14 percent lower than those in 1975 The rapid drop in industrial country inflation accounts for most of the remaining weakness The value of the dollar explains a relatively small proportion of the overall differences between the two expansions because the dollar also appreciated on average during the first eight quarters of the 1975 expansion As against this weakness, slightly stronger average industrial production growth in the major six industrial countries has propped up commodity prices to a mild extent

The picture changes greatly when we consider the second half of 1984 The preeminent factor explaining the decline in prices in the second half of 1984 is the exchange rate, which appreciated about 10 percent (Table 4) Slowing industrial production growth and inflation also contributed some downward impetus, but less than half as much as the exchange rate¹⁰

In order to focus on the economic determinants of

⁷Four of the indexes include coffee prices, with weights varying from 10 percent to 19 percent of the total index Both coffee production and prices are highly volatile

⁸In particular, growth in the IMF commodity price index was projected in-sample for the 1975 expansion and out-of-sample for the 1982 expansion The conclusions hold in general for the other indexes

⁹The coffee factor may also be capturing other weather effects to some small degree In Brazil, for example, the wheat, soybean, corn, and cocoa regions are adjacent to the coffee growing region

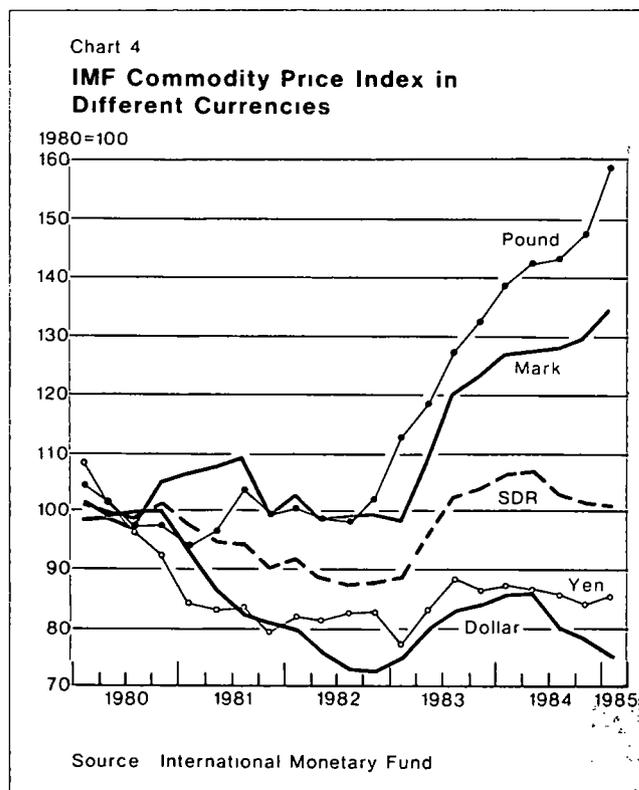
¹⁰Coffee prices weakened in the second half of 1984, although Table 4 suggests that they should have been increasing Eliminating this coffee effect would remove slightly less than half the discrepancy between the actual price drop of 20 percent and the predicted drop of 10 percent

commodity price movements, the same out-of-sample projections were done for the IMF commodity price index excluding food and beverages (Table 4, column 2) The results confirm the basic consistency of 1984 behavior with past experience The projected decline of 14.7 percent in the second half of 1984 is very close to the actual value As with the all-commodities index, the sharp rise in the dollar accounted for the bulk of the price decline

Other Factors

The fact that the equation for all commodities underpredicts the late 1984 weakness in prices much more than does the equation for commodities excluding food and beverages hints strongly at another influence on commodity prices Apart from coffee, food prices contributed an unexpectedly large downward impetus to overall commodity prices in the second half of 1984

With the ending of the Payment-in-Kind (PIK) program and an anticipated return to normal weather conditions, analysts expected 1984 U.S. and world agricultural production to increase sharply By May 1984 the United States Department of Agriculture was predicting a very good year by 1970s standards, and certainly good when compared with 1983 levels (Table 5) And, as the U.S.



harvest came in and revised estimates of foreign production became available, production estimates rose sharply. Coming on top of an already wide gap between expected production and consumption, this new information added downward pressure to prices for these commodities. Indeed, the relationship between price movements and production estimates is even closer than suggested by Table 5. Estimates of oilseed production were pushed up through the summer, the period during which oilseed prices slid fastest. Grain production estimates were revised slightly downward between May and August during which time prices were relatively stable. Only in the last few months of 1984 did the full extent of the production surge become clear, and it was in late 1984 that grain prices dropped sharply.

Agricultural production movements also help explain some of the movements in commodity prices earlier in this expansion. As markets recognized the production impact of the unexpectedly high PIK program sign up and the bad weather, prices soared in mid-1983,

pushing commodity prices up at near record rates. Toward the end of the year, good foreign harvests and the strong dollar sharply curtailed foreign demand and stabilized prices until information on the new crop year began to drive prices down.

Again, statistical analysis supports the argument that agricultural fluctuations were responsible for much of the rapid initial rise in commodity prices in this expansion. First, it is useful to note that, excluding food and beverages, commodity prices rose by less than 15 percent early in the expansion, as compared to almost 20 percent when they are included (Table 6). Second, when food and beverages are excluded, the observed behavior of commodity prices early in this expansion is very consistent with the out-of-sample projections from the econometric equation. In contrast, including food and beverages leads to a large underprediction of price growth, again pointing to these components as major factors in the unusually strong overall commodity price increases which were observed. Apart from this source,

Table 4

The Decline in Commodity Prices During the Second Half of 1984

(Percent change at annual rate)

	All commodities	All commodities excluding foods and beverages
Actual	-20.1	-15.6
Predicted	-9.5	-14.7
Slowing attributable to * (In percent)		
Inflation	22	17
Value of the dollar	79	67
Interest rates	6	4
Coffee production	-31	†
Industrial production	24	11

*Positive value indicates contribution to slowing of commodity price growth

†Not included

Table 5

World Production and Consumption of Agricultural Commodities

Commodity	1983/84		Production 1984/85		Consumption 1984/85
	Actual	May 1984 Estimate	January 1985 Estimate	January 1985 Estimate	
Grains	1486	1597	1613	1587	
Cotton	68	73	82	70	
Oilseeds	166	182	185	182*	

Grains and oilseeds in million metric tons. Cotton in million 480 pound bales.

*Production minus estimated change in stocks

Source: United States Department of Agriculture

the main upward impetus came from the rapid increase in industrial production, which more than offset the effects of the appreciation of the dollar during 1983

This analysis indicates that the cyclical movements of commodity prices are readily explainable by short-run economic and agricultural fluctuations. However, the long-run prospects for commodity prices are probably determined by gradual movements in fundamentals which are not easily captured in the statistical approach used above. Thus, in assessing the outlook for commodity prices for any period beyond a few years, long-term factors should be integrated as far as possible.

The outlook for commodity prices

A slowing of the ascent of the dollar and somewhat faster growth in Europe would produce some moderate upward pressures on commodity prices over the short term. However, there are commodities whose long-term price prospects remain relatively weak. For example, the metals included in the various indexes tend to be heavily used in "smokestack" industries, which are in decline in many industrialized countries. The Bureau of Mines estimates that the trend growth of U.S. demand for the metals used as components in the various indexes is generally much lower than for the economy as a whole (Table 7). (The exceptions are zinc and aluminum.) In fact, consumption of the most heavily weighted items—tin, copper, and iron—is expected to fall in the medium term. The basic reason for this decline in demand is wider availability of lighter and cheaper substitutes. Plastic tubing, for example, is a substitute for copper pipes, fibre optics take the place of copper cable, and aluminum and plastic are replacing iron and tin.

Partially offsetting the long-term reduction in demand for these traditional metals is the growth in demand for more esoteric minerals used in preparing medicines (e.g., lithium), high grade metals (e.g., chromium), and so on. However, none of the major indexes includes any of these goods, as their value in international trade is small at present. Thus, it is difficult to assess the degree to which increasing demand for these metals is offsetting the diminishing demand for traditional metals.

Some sources of pressures on other individual commodity prices can be identified. Declining oil prices make synthetics (such as rayon, acrylic, and polyester) cheaper substitutes for wool and cotton. Similarly, polyester cord appears to be replacing natural fibers in many uses. To the extent that oil prices remain weak, there may be continued pressure on the prices of such

Table 6

Growth in Commodity Prices During First Five Quarters of Current Expansion (In percent)

Growth	All commodities	All commodities excluding food and beverages
Actual	19.6	14.6
Predicted	12.0	12.7

Table 7

Expected Growth in U.S. Metal Consumption (In percent)

Metal	Average annual change from 1979 to 1990
Aluminum	3.9
Copper	-0.9
Iron ore	-4.2
Iron and steel	-0.1
Lead	-1.4
Nickel	1.0
Tin	-2.4
Zinc	3.6

Source: United States Department of the Interior, Bureau of Mines, Mineral Commodity Summaries 1984, 1985

commodities. Sugar prices have been hurt by worldwide chronic overproduction, dumping from protected markets, and competition from artificial sweeteners. In these cases, as with metals, one would expect some revival of prices with greater economic growth, but the amplitude of the response may be smaller than in the past.

Conclusion

This analysis suggests that the decline in commodity prices during the second half of 1984 should not be surprising, given the dollar's rise and the slowing of both inflation and economic activity in major industrial countries. Fluctuations in agricultural production were also significant in both the rapid climb in commodity prices in 1983, as well as the subsequent fall in 1984. Thus, while the low level of commodity prices has obviously imposed hardships on producers, there appears to be no evidence that commodity prices are moving any differently now relative to their underlying determinants than in the past, or that they are heralding the onset of deflation.

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Appendix 1: Econometric Estimation

The specification of Chu and Morrison was adapted and used to explain movements in five commodity price indexes. The indexes are broadly similar, but differ in composition, weighting and the markets at which prices are quoted. It is reassuring, therefore, that the basic results are robust across all the indexes (table). The basic specification is

$$\text{PCOM} = a + b \cdot \text{CIP2} + c \cdot \text{CPPI} + d \cdot \text{CEX} + e \cdot \text{DINT} + f \cdot \text{DCOF}$$

where:

PCOM is the annualized quarterly percent change in the commodity price index,

CIP2 is the annualized two quarter growth in weighted industrial production in the United States, Japan, West Germany, the United Kingdom, France, and Italy,

CPPI is the annualized weighted wholesale price inflation rate in these six countries,

CEX is the annualized percent change in the trade weighted U.S. dollar exchange rate,

DINT is the acceleration in interest rates (r_e , the first difference of the change in the three month Eurodollar rate), lagged one quarter, and DCOF is the percent deviation from trend coffee production growth.

The estimation period was 1970-II to 1982-IV except for *The Economist* index whose estimation period began in 1976-II because of data availability. In general, the coefficients on industrial production growth and the exchange rate are the most stable, at about 2 and 1, respectively. The inflation effect is slightly more variable, but also appears to center at about 2. (Two-stage least squares estimation, using instruments for industrial country wholesale price inflation, gives very similar results.) The interest rate acceleration term is statistically significant only for the IMF indexes, but is quite stable across all indexes and in regressions on subcomponents of the indexes. The coffee effect is surprisingly strong, given that the variable is constructed by interpolating annual data.

Coefficients of Commodity Price Index Equations

Explanatory Variable	IMF	IMF ex food and beverages	The Economist	UNCTAD	World Bank
Industrial production growth (CIP2)	2.4*	2.5*	2.0†	2.1*	1.6*
Inflation (CPPI)	2.1*	1.6*	2.2†	2.7*	4.4*
Exchange rate appreciation (CEX)	-0.9*	-1.1*	-0.8†	-1.1*	-1.0*
Interest rate acceleration (DINT)	-2.9†	-3.2†	-2.6	-2.0	-2.4
Coffee deviation (DCOF)	-0.8*	‡	-0.7†	-1.0*	-0.3
Constant	-10.7	-8.9	-8.8	-13.7	-26.0
Adjusted R ²	0.63	0.48	0.45	0.60	0.66
D.W.	2.1	1.45	2.4	2.2	2.3
Standard error	18.8	23.2	20.2	22.0	23.0

*Significant at 1 percent

†Significant at 5 percent

‡Not included

Appendix 2: Commodity Weights as a Percent of Total Index

Components	IMF	The Economist	UNCTAD	World Bank	Commodity Research Bureau	BEA Sensitive Materials Prices	PPI-Crude Nonfood Materials
Foods & Beverages	49.6	48.8	50.0	58.3	40.5	0.0	0.0
Cereals	81	91	45	75	90	*	*
Meat	58	45	08	19	90	*	*
Sugar	66	59	42	109	45	*	*
Bananas	24	*	09	15	*	*	*
Orange juice	*	*	*	13	*	*	*
Pepper	*	*	03	*	*	*	*
Oils & oilseeds	85	113	250	86	135	*	*
Coffee	122	129	102	187	*	*	*
Cocoa	36	4.0	26	51	45	*	*
Tea	24	11	104	28	*	*	*
Non-food, Nonmetal							
Raw Materials	22.5	21.0	25.0	18.4	36.0	82.6	70.4
Cotton	77	41	81	51	45	67	88
Wool	64	38	08	*	45	04	*
Rubber	52	30	63	54	45	11	19
Hides	18	15	06	*	45	14	38
Jutes	09	01	04	03	45	01	*
Sisal	04	01	03	*	*	*	*
Timber & logs	*	71	84	48	*	636	151
Oils & oilseeds	*	13	*	*	*	*	*
Wastepaper	*	*	*	*	*	12	27
Sands & gravel	*	*	*	*	*	81	219
Tobacco	*	*	*	28	*	*	153
Potash	*	*	*	*	*	*	17
Print cloth	*	*	*	*	45	*	*
Burlap	*	*	*	*	45	*	*
Tallow	*	*	*	*	45	*	*
Rosin	*	*	*	*	45	*	*
Metals	27.9	30.0	25.0	23.3	22.5	17.4	29.6
Copper	136	98	83	78	45	38	74
Iron ore	58	*	52	41	45	95	58
Tin	31	24	30	35	45	*	*
Aluminum	28	105	33	23	*	27	36
Zinc	10	23	11	08	45	*	*
Nickel	08	33	*	07	*	*	*
Lead	08	20	05	08	45	*	*
Other non-ferrous	*	*	35	33	*	14	*
Iron and steel scrap	*	*	*	*	*	*	128

Prepared by Joann Martens, Federal Reserve Bank of New York
 *Not included