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A Monetary Perspective on the Relationship between Commodity and Consumer Prices

Frank Browne and David Cronin

Abstract

In this article, we argue that long run monetary determination of both commodity and consumer prices and their differing, but related, short-to-medium term responses to monetary pressures may help explain US CPI and commodity price index (comprising agricultural items and raw materials) data since the early 2000s. We draw on a recent paper of ours (Browne and Cronin, 2006), and an overshooting model therein, for our analysis. It is argued, firstly, that a long run proportional relationship should exist between commodity prices and the money supply on the one hand and between consumer prices and the money supply on the other. Secondly, following a change in the money supply commodity prices will overshoot their new long run values before readjusting while consumer prices will move slowly toward their new equilibrium. These arguments are supported by the US data used.

We also make a new application of the model to the constituent components of the US CPI and find that it can also help explain recent price behaviour in this case. Our analysis suggests that the food component of the CPI should not, at least in the US case, be seen as a "nuisance" variable in monetary policy analysis.

1. Introduction

Money growth and real interest rates have been respectively high and low by historical cyclical precedent since the start of the current decade. Their failure to show up in subsequent headline (e.g. CPI) inflation in developed countries has been a source of puzzlement. At the same time, commodity prices have risen considerably. Why has headline inflation behaved as it has when two supposedly key influences on it – commodity prices and monetary pressures – are behaving in a way that might be associated with higher inflation rates?

In this article, we argue that long run monetary determination of both commodity and consumer prices and their differing, but related, short-to-medium term responses to monetary pressures may help explain their price behaviour since the early 2000s. Our theoretical argument is that in a world comprising goods whose prices are highly flexible, like commodities which are traded on exchanges, and other goods whose prices are sluggish, such as consumer goods which are subject to longer-term contracts and menu costs, the prices of the former initially over-adjust (overshoot) in the face of monetary pressures to compensate for the prices of the latter not being able to respond immediately. This overshooting, however, is not long-lived as consumer good prices begin to respond to changes in the money stock. As consumer good prices start to adjust, the overshooting of commodity prices is corrected. Ultimately, both types of goods prices change by the same percentage amount as the money stock.

We draw on a recent paper of ours (Browne and Cronin, 2006) as the basis for the arguments in this article. There, as well as discussing and formalising our perspective on the relationship between commodity prices, consumer prices and money, we used econometric techniques and US data to investigate our model's empirical relevance. We found that both consumer prices and commodity prices move in proportion to the money stock in the long run. In the short-to-medium term though,

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commodity prices are much more responsive than consumer prices to changes in the money stock. It takes time for money growth to manifest itself in consumer prices while the more flexible commodity prices overshoot their long run values. Over time, consumer prices duly respond to money growth and the commodity price overshooting is corrected. Eventually both adjust in proportion to the money stock. The empirics, therefore, provide broad support for our prior views in this area, with the temporal behaviour of both consumer prices and commodity indices comprising agricultural and raw material prices being explained by money.

In section 2, we provide a review of the literature that has previously examined the relationship between money, commodity prices and the CPI. In section 3, we expand on the outline of our own view of their interrelationship given above and summarise the econometric evidence that supports our view. We also look at developments in commodity prices and the US CPI since 2001 and identify some patterns therein that we believe can be explained by our perspective.

We make a new application of our model in section 4 by examining the constituent components of the US CPI and seeing whether the model can explain their behaviour. We find that both the CPI-less-food-and-energy (sometimes referred to as "core CPI") and the food component of the CPI move in proportion to the money stock in the long run. While the CPI food component does not overshoot its long run value in response to a change in the money stock, it does move more quickly towards it than the CPI-less-food-and-energy component does. As a result, the food component of the CPI should not, at least in the US case, be seen as a "nuisance" variable in monetary policy analysis. We conclude in section 5 with a number of suggestions that we believe arise for monetary policy analysis from our research.

2. Commodity Prices, Inflation and Monetary Policy: A Literature Review

The interaction between consumer prices, commodity prices and monetary policy has been the subject of numerous papers over the past twenty-five years or so. Many US studies of the commodity price-consumer price relationship, written between the mid-1980s and mid-1990s, often give little attention to the role of monetary variables in the relationship between commodity and consumer prices.[1] Instead, they tend to examine the signalling or predictive power of commodity prices for consumer price inflation as a basis for assessing how commodity prices could serve as an input into monetary policy formulation. The papers were written, in many cases, in response to actual prices behaviour in the 1970s and early-1980s when rising commodity prices seemed to lead a pickup in CPI inflation. In the main, they examine whether commodity prices actually lead and have predictive power for CPI inflation. Their evidence is quite mixed. A notable feature of these papers is that the existence of a long-run relationship between consumer and commodity prices is often examined in a bivariate context, with commodity prices posited beforehand as the variable driving consumer good prices. Most studies, however, do not find a cointegrating relationship existing between the two price variables.

Monetary variables as drivers of related movements in both commodity and consumer prices are considered in Jeffrey Frankel's overshooting theory of commodity price behaviour (Frankel 1984, 1986). His thesis is that real interest rates exert an important influence on real commodity prices because of the price stickiness of what he terms "manufactured goods", or finished goods (these would encompass consumer goods). Accordingly, monetary policy has an impact on commodity prices through its effect on real interest rates.

1 See Webb (1988), Garner (1989), Marquis and Cunningham (1990), Cody and Mills (1991), Pecchenino (1992), Blomberg and Harris (1995), and Furlong and Ingenito (1996).

A monetary policy-induced rise in the real short-term interest rate, for example, causes commodity prices to fall according to Frankel's model. This occurs because a rise in nominal interest rates effected by monetary policy, for instance, will be associated with a higher real interest rate as the price of finished goods are sticky in the short run. Since the real interest rate represents the opportunity cost of tying up resources in commodities then, all other things being equal, an increase in the real interest rate reduces the demand for commodities leading to a drop in their real prices. This price change occurs quickly as commodities are traded in auction markets, which are particularly responsive to policy measures.

The extent of the decline in commodity prices is dictated by a no-arbitrage condition. This requires that they fall sufficiently far to ensure that their subsequent appreciation to their equilibrium values compensates their holders fully for the increased cost of carrying them. They "overshoot" their long run value in order to ensure equilibrium is maintained in financial markets. Eventually, as all prices adjust fully to the monetary policy action, the real interest rate and the real commodity price revert to their equilibrium values.

Frankel's focus is primarily on the impact real interest rates have on real commodity prices, with the stickiness of finished goods prices relative to commodity prices playing a key role in the dynamic response of commodity prices to monetary policy. Boughton and Branson (1991) derive a number of empirically testable propositions from an extension of Frankel's model where the CPI is used as the measure of manufactured or finished goods. Their propositions find mixed empirical support. There is no evidence of a long run relationship between the level of consumer prices and commodity prices while the inclusion of commodity prices does not improve post-sample forecasts of the CPI. They do find that turning points in commodity inflation frequently precede turning points in CPI inflation.

Following a hiatus in the late-1990s, recent years have seen renewed interest in the links between commodity prices and consumer prices, as well as the role monetary policy may be playing in their movements over time.[2] Barsky and Kilian (2002) revisited the Great Stagflation of the 1970s and showed that monetary contractions and expansions can explain stagflation. This runs counter to the traditional view that oil price rises owing to supply shocks were the main force driving high inflation in goods and services and lower output in the 1970s. Barsky and Kilian's econometric evidence indicates that monetary conditions can account for the rise in the price of oil and other commodities at that time. They conclude that stagflation is first and foremost a monetary phenomenon.

Frankel (2007) reasserts the relevance of his overshooting theory to developments in commodity prices. The key point made in his earlier contributions, he stresses, is that real commodity prices will respond in the opposite direction to changes in real interest rates. For this reason, he argues that declining real interest rates may help explain rising commodity prices during 2002-4. Frankel illustrates this relationship by graphing annual observations of the US real interest rate against an annual series of US real commodity price indices over the period 1950 to 2005, which shows a negative relationship existing between the real interest rate and those price series. We replicate this relationship in Figure 1, fitting a trend-line to the scatter-plot.[3] His own theory, Frankel emphasises, attributes this empirical phenomenon to monetary policy increasing or decreasing real interest rates in the short run with predictable knock-on effects for commodity prices. Among the implications for monetary policy, Frankel suggests that central banks must monitor real commodity prices as their values may reflect whether real interest rates are at an appropriate level for meeting policy objectives. He specifically points out that

2 Frankel (2007) suggests that interest in commodity prices' impact on the economy tends to rise and fall in line with actual commodity prices.
3 For the real commodity price index, we use an annualised average of the CRB Spot Index, a broadly-based US commodity index, deflated by the CPI. The real interest rate is calculated as an annualised average of the (nominal) rate on a one-year constant-maturity US T-bill less the annualised average of the CPI inflation rate in the same year. Our sample period is shorter than Frankel's, covering the years 1954-2006.

high real commodity prices can be a signal that monetary policy is too loose.

3. A New Model of the Relationship between Money, Commodity Prices and Consumer Prices - The Overshooting Model

In our 2006 paper, we offer a fresh, monetary-based perspective on the relationship between commodity prices and consumer prices. We argue, on the basis of a number of propositions and a formal model, that, firstly, a long run proportional relationship exists between commodity prices and the money supply on the one hand and between consumer prices and the money supply on the other. Secondly, we contend that following a change in the money supply commodity prices will overshoot their new long run values before readjusting while consumer prices will move slowly toward their new equilibrium.

The three propositions on which we base our model and subsequent empirics are:

(i) exogenous changes in the nominal money stock lead to equivalent percentage changes in the overall price level, which comprises commodity and consumer good prices, under conditions of stable money demand;

(ii) exogenous changes in the money stock are neutral in the long-run steady state, implying that all individual prices, whether they be consumer goods or commodities, adjust over time in the same proportion as the money stock, thus leaving all relative prices unchanged; and

(iii) in response to a change in the (exogenous) money supply, commodity prices will compensate in the short run for CPI price stickiness by overshooting their new long run equilibrium values.

The first two propositions are essentially monetarist in nature. The one-for-one relationship between money and the overall price level must hold at all times to maintain monetary equilibrium and it must also hold for the prices of commodities and consumer goods in the long run. A doubling of the money stock, for instance, must, all other things being equal, have as its final outcome the prices of all goods traded within the economy increasing twofold. The third proposition stems from commodity goods being traded in auction markets, allowing them to respond quickly to monetary stimuli. In contrast, consumer prices are “sticky” in nature, responding slowly to changes in monetary conditions. A rise in consumer prices proportional to an increase in the

Figure 1: US Real Commodity Prices and Real Interest Rates, 1954-2006

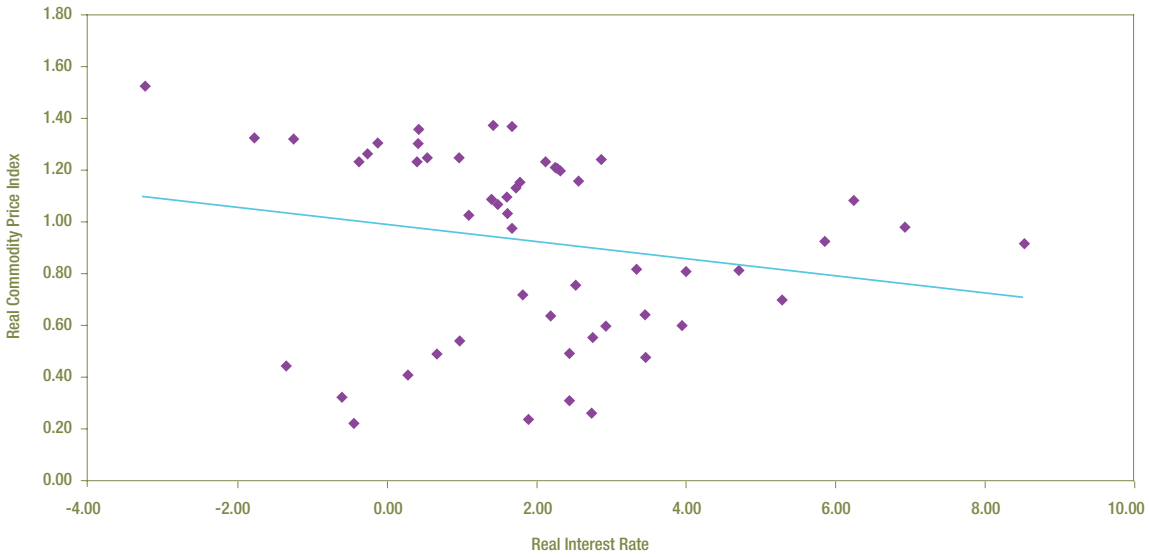
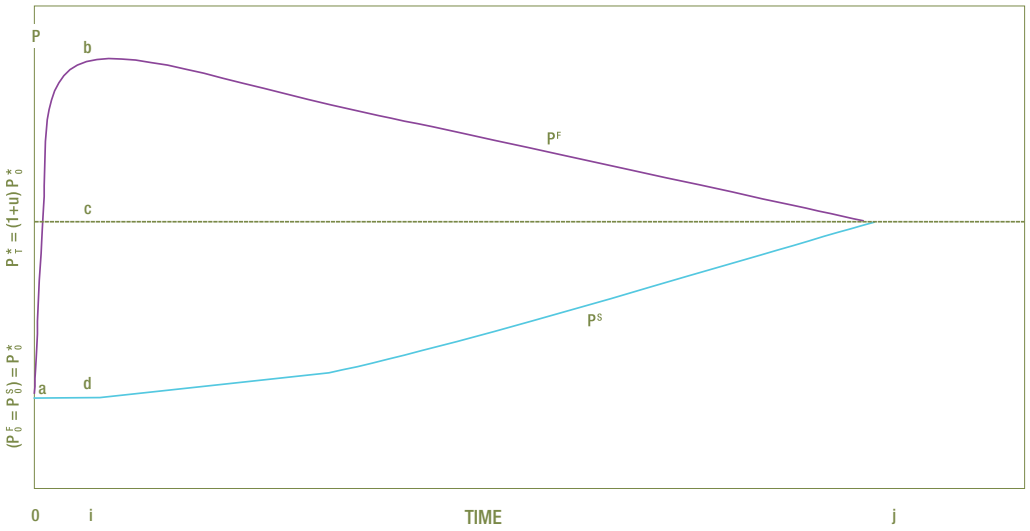


Chart 1: The Overshooting Model



money stock occurs gradually and is only completed with a considerable lag. Our third proposition then reflects the view that flexible commodity prices will overshoot their new long run value following a change in the money stock to maintain proportionality between money and the overall price level.[4] This overshooting will be corrected over time as consumer good prices adjust. The correction is complete when both sets of prices have adjusted proportionally to the change in the money stock.

Chart 1 illustrates how, according to this model, commodity and consumer prices react over time in response to a one-off change in the money supply. It is assumed that there are only two types of goods in the economy, commodities (or commodity goods) and consumer goods. Three price indices are shown on the prices axis (the y-axis). The first is the index of commodity goods prices, P^F, denoted with the superscript "F" to indicate its flexible price nature, while the second is the index of consumer prices, P^S, with the "S" superscript reflecting consumer prices being sticky. The third index represents the overall index of goods prices in the economy, P, comprising commodity and consumer good prices. It is assumed, for the sake of simplicity, that both P^F and P^S have the same nominal value in the initial period (0). This means that their weighted average, the overall index P, will also have the same value at that time. This allows us plot all three indices in the initial period (0) at the same point, a, on the price axis (as P_0^F, P_0^S, and P_0). The overall index, P_0, is further designated with an asterisk to indicate that it is an equilibrium value, that is a price level determined by the size of the money stock at that time. Both P_0^F and P_0^S are also assumed to be at their long run money-determined values at that particular time.

Suppose now that in the next period, there is a one-off increase in the money stock of μ percent. The first proposition above indicates that the overall price level will also increase in that period by μ percent to P_T^*. This price level is designated with a "T" subscript to indicate that, in the absence of any further changes in the money stock, which we assume to be the case, this is the overall price level that will hold indefinitely into the future. In Chart 1, a dotted line denoting this new long run level of P is drawn off P_T^* on the y-axis and it runs parallel to the time axis (x-axis) in all subsequent periods.

The second proposition above points to both P^F and P^S rising in proportion to the money

4 This is the well-known Le Chatelier's principle as applied to price theory: if not all goods prices in the economy are free to adjust fully to a change in economic conditions then other goods prices must initially overshoot their new equilibrium values to compensate, a dynamic feature that holds until all prices are able to adjust to their new equilibrium values.

stock in the longer run, i.e. by μ percent. This means, given their initial values at time 0, the price of both categories of goods will eventually converge on the dotted horizontal line in Chart 1. The third proposition, however, is that in the short-to-medium term the commodity price, P^F, will respond to the change in the money stock by initially overshooting its new long run value owing to the price of the consumer good being unable to adjust immediately to its new equilibrium value, which is also on the dotted line. In other words, the commodity price, denoted by the purple line, will lie above the dotted line for some time after the monetary stimulus while the consumer good price, denoted by the blue line, lies below it. As the consumer price starts to rise, the commodity price begins to decline downwards towards the dotted line, thus correcting the overshooting of its price. Eventually, at time j in Chart 1, both prices converge on the dotted line and the adjustment of both to the change in the money stock is complete.

Another feature of this perspective on commodity and consumer price adjustments over time in response to changes in the money stock is that the deviations of both consumer prices and commodity prices from their equilibrium values should contain information on subsequent changes in consumer prices. These two gaps can be shown in Chart 1. At time i (it would be possible to choose any point along the y-axis up to j), the gap between the current commodity price and its equilibrium value is given by bc. This is deemed a positive gap because the current commodity price (at b on the solid purple line) exceeds its long run value (at c on the dotted line). In contrast, there is a negative consumer price gap (of cd) as the long run price of this good (of c on the dotted line) exceeds its current price (of d on the solid blue line).

It can be seen in Chart 1 that P^S is rising in the quarters subsequent to time i so that its rate of change must be positive. This connection between a negative gap in consumer prices, such as exists at time i, and subsequent positive consumer good inflation has previously been made in monetary economics in the so-called P-star theory (see Hallman, Porter and Small (1991)). Our theory, illustrated through Chart 1, makes this connection as well and also suggests that a positive commodity price gap, such as bc in that chart, will be followed by a rise in consumer good prices. Commodity price gaps then should be an indicator of consumer price pressures and, if quantifiable, could provide a useful tool in monetary analysis.

An Empirical Investigation of the Overshooting Model

In our 2006 paper, we undertook an econometric analysis to test whether this perspective on the relationship between commodity prices, consumer prices and money finds support empirically. The details of that analysis and the specific methodology used are included in that paper. Here, we report the principal results.

Initially, we found that, for US data, long run proportional relationships exist between a number of commodity price indices and money and, in turn, between the CPI and money.[5] This means that a ten percent rise in the money stock, for example, manifests itself in the long run in a matching ten percent increase in both the CPI and the commodity price index under consideration.

We also examined how both types of price index adjust over time to a change in the money stock, en route to their long run, proportional relationships with the money stock being re-established. Figures 2a and 2b illustrate the patterns of adjustment for the CPI and one of the three commodity price indices considered in the 2006 paper, the Commodity Research Bureau Spot Index (CRBSI).[6] Figure 2a shows the indices' response over time while Figure 2b plots the rate of change per quarter in those responses, i.e. the rates of inflation/deflation in the respective indices.

5 We also examined euro area data but found their features did not lend itself to the econometric methodology we use.
6 The CRB Spot Index is a broadly-based index comprising 22 food and raw material commodities.

Figure 2a shows patterns of adjustment over time in the actual data that are qualitatively close to those in Chart 1 above. Following an exogenous increase in the money stock, the CRBSI rises quickly, reaching a maximum value after 13 quarters. At first, the CPI changes little, then starts to rise, and does so at an accelerating pace after about 5 quarters. Figure 2b shows CPI inflation peaking after about 12-14 quarters just as the rate of change in the CRBSI moves into negative territory. Obviously, a negative rate of change means that the level of the CRBSI is falling: an overshooting of the CRBSI in response to the money disturbance is being corrected. Eventually, as Figure 2a shows, both the CPI and CRBSI are converging to the same level.

Some further observations can be made on Figure 2b. The CRBSI reaches much higher rates of inflation than the CPI. It also has a prolonged episode of negative inflation rates, or deflation, between 14 and 33 quarters after the initial money disturbance. Its range of inflation rates is much larger than that of the CPI. The CPI inflation rate is initially unresponsive to the money shock but starts to rise steadily after 5 quarters or so before reaching a peak between quarters 12 and 14. Its decline thereafter is also slow. The overall system of prices starts to settle down after about 40 quarters or so.[7] The impact of a money shock on prices then is quite long, a familiar finding from studies of the interaction between money and prices.[8] A final feature of the empirical analysis in our 2006 paper is that lagged values of the gap between the observed CPI and its long run, equilibrium value and the gap between the

7 It is for this reason that the number of quarters on the horizontal axis differs between Figures 2a and 2b.
8 See, for example, Batini and Nelson (2001).

Figure 2a: Responses of Price Indices to a Change in the Money Stock

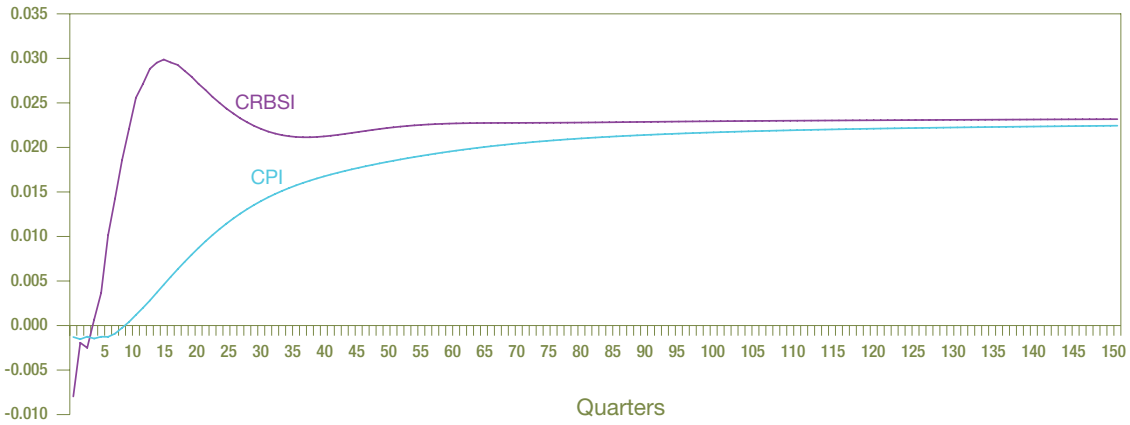
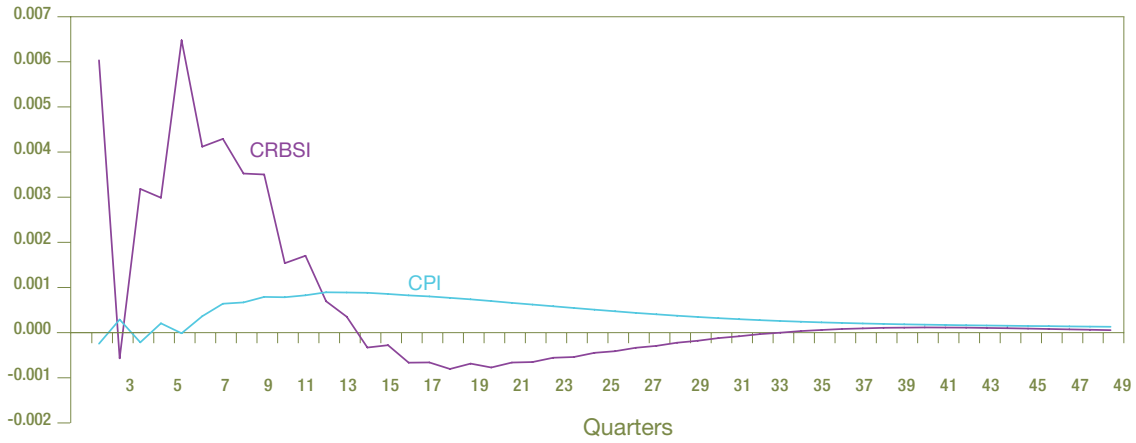


Figure 2b: Rates of Change in Price Indices



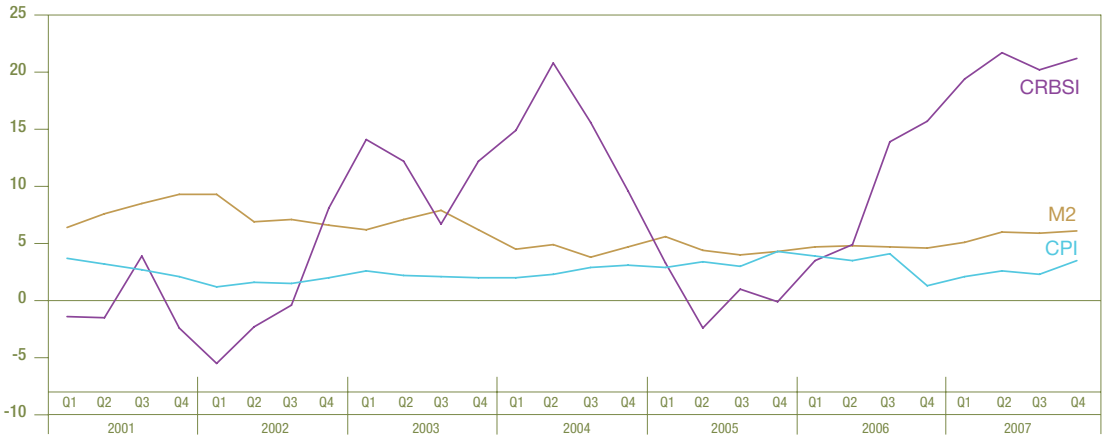
observed commodity price index and its long run value each have explanatory power, with the expected sign, in an equation explaining current period CPI inflation.

These empirical results are based on US data from 1959q1 to 2004q1. An obvious question is whether the patterns initially hypothesised and then broadly supported over that sample period can help explain CPI and commodity price behaviour in the current decade. In Figure 3, we plot year-on-year rates of growth in the CRBSI, the US CPI and US M2 on a quarterly basis from January 2001 to October 2007. The starting date is chosen because that was the month when the Federal Reserve began to lower its Federal Funds rate target from a 9-year high of 6½ percent in the wake of the dotcom collapse. This interest rate continued to decline in an intermittent fashion to a rate of 1 percent in mid-2003, where it remained for close to a year before a subsequent, progressive raising of that interest rate commenced in mid-2004. That concluded in mid-2006 and the target rate remained at a level of 5¼ percent up to September 2007. The target rate was then lowered in two steps to 4½ percent by end-October 2007.

Figure 3 shows that as interest rates were lowered in 2001, money growth rates started to rise and remained relatively high, on a year-on-year basis, up until mid-2003 as the policy target interest rate declined. The graph indicates that the CPI inflation rate was initially unresponsive to the monetary stimulus then occurring. A sustained rise in CPI inflation seems only to commence in early 2004, some 3 years, or 12 quarters, after the initial loosening of monetary policy. While M2 growth in the period covered in Figure 3 peaked in 2001q4, the subsequent peak in CPI inflation occurs in 2005q4, implying a peak-to-peak delay of 16 quarters. This is a broadly similar lag to the peak response of CPI inflation following a rise in the money stock in Figure 2b.

The CRBSI seems more responsive to money growth. Its rate of inflation peaks in the second quarter of 2004. After this, it starts to decline through late-2004 and early-2005 before its rate of inflation turns negative, albeit briefly, in mid-2005, just as CPI inflation is rising toward a four-year high. This pattern is comparable to that in Figure 2b. We also see that the CRBSI inflation rate fluctuated across a greater range than the CPI rate during the 2001-7 period covered in Figure 3 – also in keeping with the pattern shown in Figure 2b. Finally, we note that since mid-2006 a gap between the year-on-year rate of change in M2 and the CPI has re-emerged and has been accompanied by CRBSI inflation rising substantially.

Figure 3: Year-on-Year Rates of Change (%) in US M2 and Price Indices, 2001 q1 (Jan) - 2007 q4 (Oct)



4. The Core CPI and Other CPI Components: Another Application of the Model

Our model was initially applied, in our 2006 paper, to studying the relationship between commodity prices and the CPI. Commodities and consumer goods are considered to have starkly contrasting price properties, with commodity prices being determined in auction markets and consumer goods, as the final output of production, being impacted much more slowly by economic events. This dichotomy places commodities and consumer goods at opposite ends of the price adjustment spectrum. There are many goods and goods indices, however, that lie somewhere in between commodities and consumer goods in terms of how quickly their values respond to economic developments. These include wholesale price indices, producer price indices, as well as deflators used in measuring nominal changes in economic activity, such as trade deflators.

Even within the CPI, there are goods whose prices are more flexible than others. Using micro data, Alvarez et al (2006) find that energy and unprocessed food have the most flexible prices among consumer goods within the euro area while services have the lowest. For the United States, Bils and Klenow (2004) find energy-related and fresh food products in the CPI to display frequent price changes. They also find durable goods show more frequent price changes than the overall consumer bundle while goods sold in more competitive markets change price more often than other goods.

In relation to monetary policy, a conceptual demarcation is often made between “core” and “non-core” CPI inflation, with core inflation reflecting monetary developments and non-core inflation owing to market-specific and other non-monetary events. In other words, there is a monetary and non-monetary component to the overall, or “headline”, CPI. It follows, from this perspective, that the monetary-driven, core CPI inflation should be extracted from overall CPI inflation and be given particular attention in monetary analysis. One means of undertaking this is to remove transitory elements from the aggregate index or the prices of the various goods and services that make it up. The factor driving the remaining component(s) is taken to be monetary policy and, therefore, the adjusted CPI provides a measure of monetary or core inflation.

Such measures of core inflation, however, by often requiring statistical analysis of individual good price series, are computationally involved and have their own drawbacks. A more pragmatic suggestion for measuring core inflation is based on the notion that while monetary policy will transmit an impulse to the prices of all the goods that make up the overall CPI, the prices of some of its components are excessively volatile owing to the impact of other transient, non-monetary influences. The food and energy components of the CPI are considered particularly volatile relative to the other components of the CPI. For this reason, a CPI-less-food-and-energy index is often published, is considered a good proxy for monetary-driven inflation, and is commonly referred to as “core CPI”.

This convenience, however, can lead to the perception that the food and energy components of the CPI are not determined in the long run by money and, accordingly, have little relevance for monetary policy analysis. Our discussion in section 2 and 3 would lead us to surmise that volatile movements in the food and energy components of the CPI may reflect a swifter response of those components of the CPI to monetary stimuli. Figure 2b shows that, in reality, commodity inflation can indeed be much more volatile than headline CPI inflation while still being driven by money. If this holds true also for the food or energy components of the CPI then it is not appropriate to discard either or both from monetary analysis, rather it is imperative to see what valuable information may be extracted from them for policymaking purposes.

We reapplied our empirical methodology, substituting CPI-less-food-and-energy and a second CPI component for the overall CPI

and commodity price index used in our 2006 paper. US data are again used, covering the period 1959q1 to 2007q2. Ideally, the second CPI component would comprise both the food and energy components excluded from the "core" measure but such a measure is not published by the relevant source, the US Bureau of Labor Statistics. It only publishes separate "Food" and "Energy" components. We examined each, in turn, as the respective second index alongside CPI-less-food-and-energy.

While the results for the Energy component were disappointing, those for the Food component, however, were satisfactory from an econometric perspective and illuminating, as will be discussed. The poor performance of the Energy component may be attributable to it being exceptionally volatile, relative to both CPI Food and CPI-less-food-and-energy.

The results where CPI-less-food-and-energy and CPI Food are used are statistically well-behaved and show long-run proportional relationships arising between CPI-less-food-and-energy and the M2 money stock and between CPI Food and the same money stock.[9] Figure 4a shows how both price indices adjust to a positive change in the money stock. While both converge over time toward their new long run values and do so without any obvious overshooting, CPI Food responds more quickly to the change in the money stock. It leads CPI-less-food-and-energy in adjusting to a monetary stimulus. Figure 4b shows CPI Food inflation peaking earlier and at a higher rate than CPI-less-food-and-energy inflation. Also, the adjustments of both indices to the change in the money stock involve sharper changes in

9 These particular results are not shown here but are available on request from the authors.

Figure 4a: Responses of CPI Indices to a Change in the Money Stock

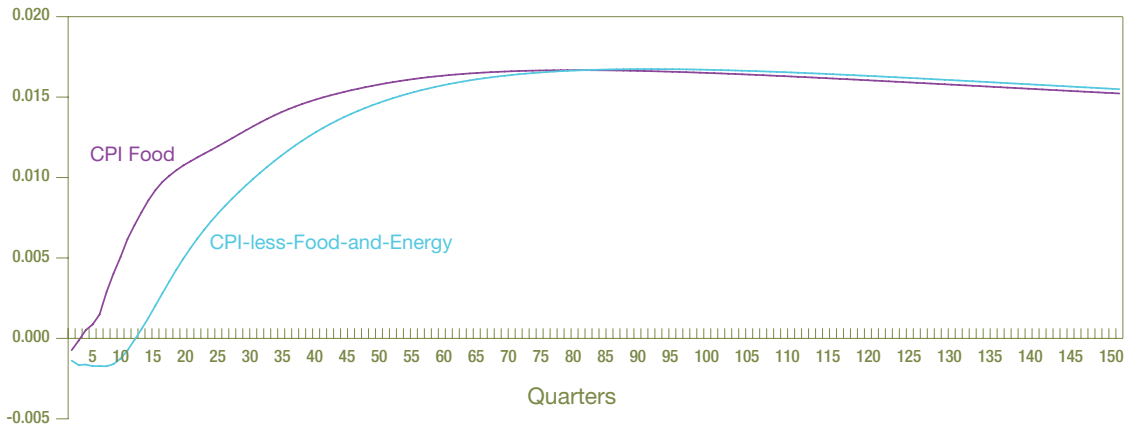


Figure 4b: Rates of Change in CPI Indices

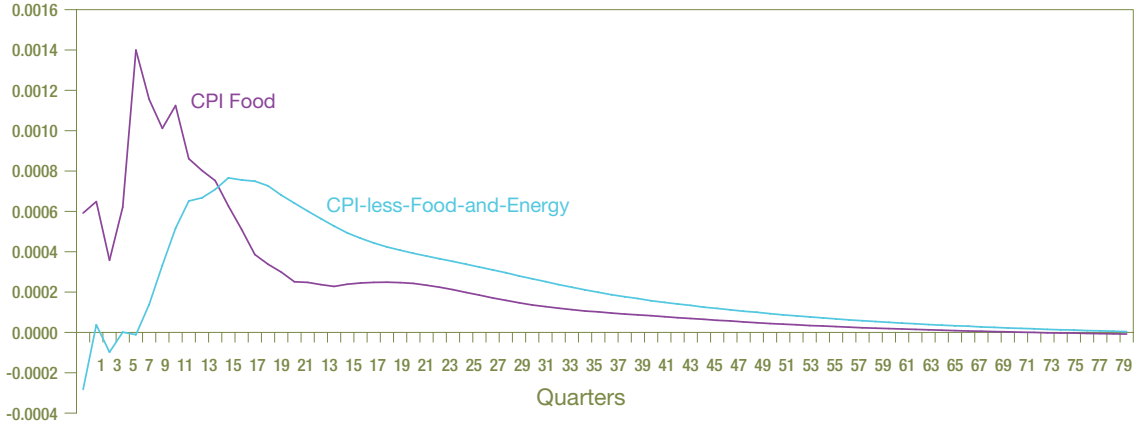
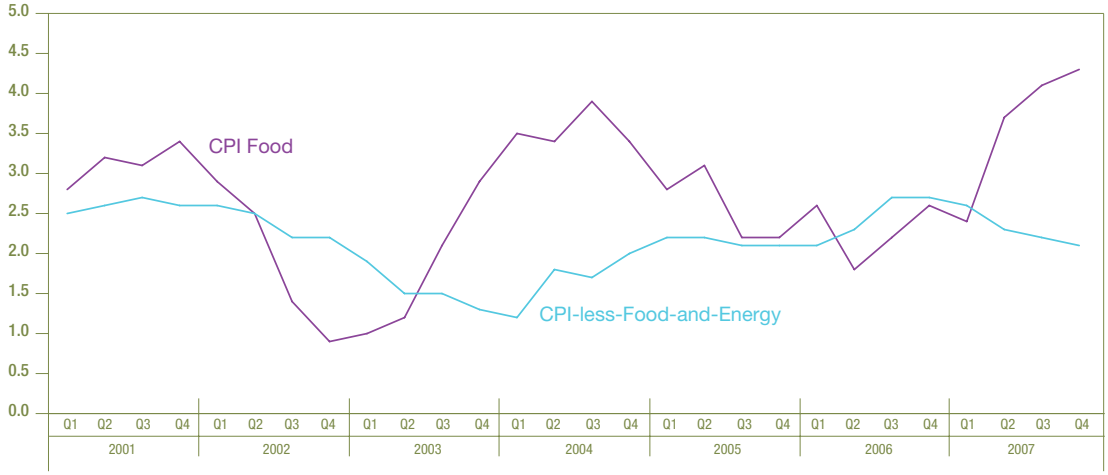


Figure 5: Year-on-Year Rates of Change (%) in CPI Indices, 2001q1 (Jan) - 2007q4 (Oct)



CPI Food inflation. This may go some way in explaining the long-observed higher volatility of CPI Food inflation relative to CPI-less-food-and-energy inflation while underlining that this feature of the data is money-driven.

Bryan and Cecchetti (1994, p. 197) identify the term core CPI in many economists' minds with "the long-run, or persistent, component of the measured price index, which is in some way tied to money growth". Using this yardstick, CPI-less-food-and-energy and the CPI Food component should, according to our results, both be classified as core CPI components. The obvious follow-on suggestion is that it would be worthwhile examining, at least in the US case, whether only the energy component of the CPI should be excluded from the overall CPI in arriving at a measure of core CPI and in studying underlying inflationary trends.[10]

It is again interesting to look at developments in CPI-less-food-and-energy and CPI Food inflation in the current decade and compare them with the longer-sample based plots in Figure 4b. Year-on-year changes in both indices are shown in Figure 5 from 2001q1 onwards, the same starting point as that in Figure 3. The rate of CPI Food inflation can be seen to have fluctuated more than that of CPI-less-food-and-energy. There is also some indication that the pattern in CPI Food inflation led that in CPI-less-food-and-energy inflation in recent years. This seems evident between late-2001 and early-2004 when a fall in the CPI Food inflation rate up to late-2002 led a decline in CPI-less-food-and-energy inflation up to early-2004. In the period from mid-2003 to mid-2005, CPI Food inflation rose sharply and then declined, a pattern that also appears to be occurring in a milder form for CPI-less-food-and-energy inflation between early-2004 and end-2007. These developments are close to those in Figure 4b where the rise-and-fall in CPI Food inflation occurred before that in CPI-less-food-and-energy.

Finally, we note that year-on-year CPI Food inflation, like CRBSI inflation, picked up sharply in 2007.

5. Conclusion

In this article, we have discussed a model that we believe can account for the long run and dynamic behaviour of commodity prices and consumer prices and that may go some way toward explaining how both sets of prices have behaved in recent years. The building blocks of the model invoke long-run monetary neutrality conditions pertaining to relative prices along with the observation that commodities, being traded on auction markets, have prices that adjust quickly to

10 Using a different form of analysis, such a proposal has already been made by Gavin and Mandal (2002).

economic events while consumer prices are subject to rigidities in the short-to-medium term arising from menu costs and contracts. This leads, among other things, commodity prices to overshoot long run values in response to exogenous money growth. In sections 3 and 4, we related empirical findings from an earlier paper of ours, along with new results, that, we believe, back up our perspective on the relationship between money and different price indices.

There are a number of key points that emerge from the model and the empirical results. First, monetary developments would seem to have a strong bearing on how price indices behave. Our results suggest money determines the price of both commodity and consumer price indices in the long run. Likewise, it can explain their behaviour in the short to medium term. The indices' individual responses to monetary pressures seem, in our view, related and can be explained by their varying degrees of price stickiness. It is noteworthy that monetary developments can help explain the comulative behaviour of agricultural and raw material commodity prices over time.

Another point we would make is that commodity prices can provide some indication as to how the CPI or a similar final goods price index will behave in the near future. A sharp pickup in commodity prices (particularly if it is occurring across a broad range of commodity classes) may reflect a monetary policy that is too loose. A sudden fall-off in commodity inflation (including negative rates of change) may actually precede or occur alongside relatively high CPI inflation. Commodity and CPI gap variables can explain next-quarter CPI inflation.

Finally, the behaviour of what many commentators deem one of the two non-core components of the US CPI, CPI Food, can be explained by money. This means that it cannot be classified as a nuisance or be easily discarded in monetary analysis. Indeed, if core CPI is a useful means of assessing longer-term price adjustment then our results suggest that, at least in the US case, there may be grounds for examining whether CPI's food component should be included in it.

We would conclude by suggesting that the pickup in commodity inflation rates in recent years should, according to our perspective, translate into higher CPI inflation rates. We would also note that the rise in commodity prices in recent years has been broadly based across commodity classes. This suggests some common factor behind these movements, which we would expect to be strong rates of global money growth.

At the same time, another account of money and price developments in recent years seems to be losing its force. It explains low headline inflation occurring against a backdrop of strong money growth and low real interest rates by emerging markets, especially China, "exporting" deflation to the developed world in the form of lower-priced finished goods with this acting to offset inflationary pressures worldwide. Deflation in Japan would also be considered to have had a similar impact. These factors, however, seem to have fallen away and been reversed in the last year or so. Between October 2006 and October 2007, the annualised rate of change in US import prices from China went from -1.3 per cent to 2.2 per cent. China's domestic inflation rate has accelerated from moderately negative values to 6½ percent in August 2007. Much of this latter increase has been attributed to raw material and other commodity price increases but more especially to food price increases. Japan also now seems to be facing big hikes in food prices after a long period of extreme monetary accommodation. Some of the benign influences on inflation in developed countries, it seems, are being removed, with possible adverse implications for developed countries' inflation prospects.

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