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Abstract
Using forty-one years of monthly data, this paper assesses the impact of economy-wide supply and demand shocks on commodity prices in three of the world's major economies. Utilising a small theoretical macro model, empirical results support the hypothesis that the relationship between real commodity prices and inflation can be either positive or negative depending on the relative importance of supply and demand shocks in the national economy. Our results also show that differences occur across economies with the UK commodity returns registering more sensitivity to demand shocks than those of US and Japanese markets. Supply and demand components of commodity prices have also varied over time and across economies, suggesting that commodity markets are not fully globally integrated but are highly sensitive to national influences.

Key words: real commodity prices; demand and supply shocks; SVAR; variance decompositions.

JEL. classification codes: C22, E0, E3, G1, G12

1. Introduction

There exists a substantial literature on the relationship between commodity prices and the macroeconomy with a major interest being the contribution of the commodity pricing process to changes in aggregate price levels and their importance as forward indicators of the inflation cycle (e.g. Bosworth and Lawrence (1982), Beckerman and Jenkinson (1986), Rowlatt (1988), Cristini (1995), Cashin *et al.* (2002), Fraser and Rogers (1992) and Artis *et al.* (1995), Mahdavi and Zhou (1997), Bloch *et al*. (2004).

While, in general, research has supported a significant relationship between commodity price movements and inflation, the strength and sign of this relationship appears to vary over time: Rowlatt (1988) for example using data from 1969 to 1985, reports evidence showing periods when the relationship between changes in commodity prices and inflation is significantly positive (1973 to 1975 and 1979 to 1981), but also that the total impact for the full sample period is insignificant. More recently, Cristini (1995) reports empirical estimation for the period 1961 to 1984, which shows that inflation is, in least in part, an increasing function of increases in primary commodity prices. The work of Bloomberg and Harris (1995), drawing on data for the 1970-1994 period, cannot support the hypothesis of a long-run link between commodity prices and consumer prices although they report evidence to show that commodity prices can predict short-run changes in core inflation but that such predictive power varies over time. In a similar vein, Bloch *et al*. 2004, indicates that estimates of the elasticity of inflation with respect to commodity prices are considerably higher when using pre-war and post-war data than those from studies based on post-war data alone.

This paper adds to this strand of the literature by focusing on the dynamics of the relationship between commodity prices and the price level by investigating and comparing the response of commodity prices to supply and demand disturbances in three large economies – the US, UK and Japan. The basic argument is that because of their dominant short-run asset–like characteristics, commodity prices will react differently to different types of shocks to the economy. For example, positive economy-wide supply shocks will have a positive relationship with real commodity prices, the supply shock acting as a proxy for future expected movements in real activity and have a negative relationship with inflation, so we have a negative relationship between real commodity returns (changes in real commodity prices) and inflation when faced with supply shocks. While positive demand shocks will have a positive relationship with changes in real commodity prices, their impact on inflation will also be positive, so we have a positive relationship between real commodity price returns and inflation when the economy is hit by demand shocks. As far as the authors are aware, the impact of economy-wide supply and demand shocks on commodity prices is an area of the literature that remains unexplored. A further interesting aspect of this paper is that it compares and contrasts these effects across economies thus signalling the extent to which commodity price patterns differ across national boundaries.

In order to asses the differential effects of supply and demand shocks we analyse monthly US, UK and Japanese data from 1960:1 through 2001:6 on commodity prices and producer prices using a Structural Vector Autoregression (SVAR) approach and the Blanchard and Quah (1989) (BQ) identification procedure. Essentially, the BQ procedure is based on long-run restrictions to distinguish between economy-wide demand and supply shocks and thus is able to provide insight on the differential effect of different types of shocks and why the dynamics of the commodity price – inflation relationship may change over time.

The structure of our paper is as follows. In section 2 we set out a simple macro model which we use to motivate restrictions. We also explain the way in which we identify demand and supply shocks and compute the decomposition of commodity prices into demand and supply components. We go on in section 3 to a discussion of the data used, including preliminary statistics, before turning to a discussion of our results in section 4. Conclusions are presented in section 5.

2. The Theoretical Model and the Structural VAR

The model is adapted to commodity prices from the output growth-unemployment model of Blanchard and Quah (1989), and the stock return-dividend models of Lee (1995, 1998). Assuming (log) commodity prices (cp_t) and (log) producer prices (p_t) are I(1) suggests that the two series can be affected by more than one type of disturbance and, as such, can be modelled as the sum of these components. We assume that there are two kinds of disturbances in the producer price and commodity price processes: supply and demand disturbances. Supply disturbances have a permanent effect on real commodity prices while demand disturbances may have a temporary effect on real commodity prices. Neither shock has long-run effects on changes in commodity prices or inflation.

Following Blanchard and Quah (1989) and Hess and Lee (1999), we use a simple model to illustrate the differential effects of supply and demand shocks on commodity prices and the price level as follows:

$$y_t = y_t^d + y_t^s \qquad (1)$$

$$y_t^d = m_t - p_t - r_t \qquad (2)$$

$$y_t^S = \theta_t + N_t \qquad (3)$$

$$p_t = m_t - \theta_t - r_{t-1} \qquad (4)$$

$$r_t = -am_t , \quad 0<a<1 \qquad (5)$$

$$cp_t = y_t + E_t \sum_k \rho^k \Delta y_{t+k} + k* \qquad (6)$$

where y_t^d is the demand component of (log) output and y_t^s the supply component of (log) output; m_t is the (log) money supply; p_t is the (log) of the price level; r_t is the interest rate; θ_t is the (log) of productivity; N_t is the (log) of employment, and a captures the gradual adjustment of prices and aggregate demand vis-à-vis the impact of monetary policy on interest rates. cp_t denotes (log) real commodity prices, which is modelled as the present discounted sum of the future path of output growth in the economy (i.e. from k=0 to infinity ($\sum_k$)), ρ is a discount factor and $0 < \rho < 1$ (see Hansen and Sargent (1980), Lee (1995, 1998)), $k*$ is a constant, and Δy_t is output growth. Hence, the commodity price-output spread will widen (shrink) according to players expectations regarding the future state of the economy.

The model is closed by assuming:

$$m_t = m_{t-1} + e_t^d \qquad (7)$$

$$\theta_t = \theta_{t-1} + e_t^s \qquad (8)$$

where e_t^d and e_t^s are serially uncorrelated and mutually orthogonal demand and supply disturbances, due to monetary and productivity shocks respectively.

Given equations 1 through 8, the output growth, inflation and commodity price-output ratio (ignoring the constant term) processes are given by:

$$\Delta y_t = y_t - y_{t-1} = e_t^s + a(1 - L)e_t^d \qquad (9)$$

$$\pi_t = p_t - p_{t-1} = -e_t^s + (1 + aL)e_t^d \qquad (10)$$

$$cp_t - y_t = e_t^s + a(1-\rho)e_t^d - ae_{t-1}^d \qquad (11)$$

where, Δy_t is output growth, π_t is inflation and $cp_t - y_t$ is the commodity price-output ratio.

Within this framework we can identify a supply shock as having a temporary, positive contemporaneous effect on real commodity returns, Δcp_t, with a permanent effect on the level of commodity prices. However a supply shock will have a temporary, negative contemporaneous effect on inflation, π_t, (hence a negative relationship between commodity returns and inflation – see for example Fama (1981), Hess and Lee (1999)). A demand shock however will have a temporary, positive contemporaneous effect on both commodity returns and inflation (hence a positive relationship between commodity returns and inflation) and a temporary effect on the level of commodity prices.

According to a form of Wold's decomposition theorem (Hannan, 1970), if Δcp_t and π_t are stationary processes we can model them as past values of themselves in the form of a Bivariate Vector Autoregression (BVAR) of the form $(\Delta cp_t, \pi_t)$, and from this derive a Bivariate Moving Average Representation (BMAR), that will be have restrictions consistent with the class of structural model discussed above.

The restrictions imposed on the BMAR can be illustrated as follows. Consider a two variable vector autoregression (BVAR)) z_t consisting of Δcp_t and π_t :

$$z_t = \begin{bmatrix} \Delta cp_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} \sum_k a_{11}^k \Delta cp_{t-k-1} + \sum_k a_{12}^k \pi_{t-k-1} + u_1 \\ \sum_k a_{21}^k \Delta cp_{t-k-1} + \sum_k a_{22}^k \pi_{t-k-1} + u_2 \end{bmatrix} \qquad (10)$$

where u_1 is a supply shock and u_2 is a demand shock.

In more compact form:

$$z_t = A(L)z_{t-1} + u_t \qquad (11)$$

where $A(L)=\left[A_{ij}(L)\right]=\sum_k a_{ij}^k L^k$ for i,j = 1 and 2;

$$u_t = \left[u_{it}, u_{2t}\right]' = z_t - E(z_t \mid z_{t-s}, s \geq 1);$$

$VAR(u_t) = \Omega = \sigma_{ij}$ for i,j,=1 and 2.

Hence u_t is a non-orthonormalized innovation in z_t .

Since the supply and demand shocks are unobservable, the problem is to recover them from the VAR estimation. By the Wold representation theorem, there exists a bivariate moving average representation (BMAR) of z_t:

$$z_t = \begin{bmatrix} \Delta cp_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} \sum_k c_{11}^k e_{t-k}^s + \sum_k c_{12}^k e_{t-k}^d \\ \sum_k c_{21}^k e_{t-k}^s + \sum_k c_{22}^k e_{t-k}^d \end{bmatrix} \tag{12}$$

or

$$z_t = C\ (L) e_t \tag{13}$$

where $C(L)=\left[C_{ij}(L)\right]=\sum_k c_{ij}^k L^k$ for i,j for i,j = 1 and 2,and $e_t = \left[e_t^s, e_t^d\right]'$, with the two innovations in e_t being serially uncorrelated by construction and contemporaneously uncorrelated by an orthogonalization. The variance of the vector, $e_t = \left[e_t^s, e_t^d\right]'$ is the identity matrix of rank 2 by a normalisation.

The critical insight is that the BVAR residuals u_t, are composites of the pure innovations, e_t. Comparing the BMAR in (12) (or (13)) with the BVAR in (10) (or (11)), estimates of *C(L)*, can be obtained by noting that:

$$C^o e_t = u_t \tag{14}$$

and

$$z_t = C(L) e_t = [1 - A(L) l]^{-1} u_t \tag{15}$$

where $C^o = [c_{ij}^k]$ with *k*=0. Using (5) and (6) implies that:

$$C(L) = [1 - A(L)L]^{-1} C^o \qquad (16)$$

Hence, given an estimate of *A(L)*, we require an estimate of C^o to calculate C*(L)*, which can be calculated by taking the variance of each side of (14):

$$C^o C^{o'} = \Omega = [\sigma_{ij}] \text{ for i,j = 1, and 2} \qquad (17)$$

The relationships between the BVAR and the BMAR provide three restrictions for the four elements of C^o so we need one additional restriction to just identify the four elements of C^o (see Blanchard and Quah (1989)). This is:

$$\sum_k c_{12}^k = 0 \qquad (18)$$

The moving average coefficient c_{12}^k measures the effect of e_t^d on Δcp_t after *k* periods and $\sum_k c_{12}^k$ denotes the cumulative effect of e_t^d. Setting $\sum_k c_{12}^k = 0$, therefore requires that the innovation e_t^d does not permanently influence the underlying index of commodity prices. Essentially, the coefficients c_{ij}^k in (12) represent shocks in particular variables and because e_t is serially and contemporaneously uncorrelated, we can allocate the variance of each element in z_t to sources in elements of e_t and this forecast error decomposition can be used to measure relative importance of supply and demand shocks to commodity prices and inflation.

3. Data and Preliminary Statistics

Monthly commodity price indices for world markets are collected from *The Economist* and are deflated by the relevant Producer Price Index for the US, UK and Japan collected from *Datastream*. The sample period is 1960:1 to 2001:6. Each (real) commodity price and producer price series is then transformed into natural logarithms and first differences taken, thus providing a time series of continuously compounded (real) commodity returns (i.e. $ln(cp_t)$-$ln(cp_{t-1})$ or Δcp_t), and a time series of inflation (π_t) for the US, UK and Japan.

Table 1 provides summary statistics for the series under consideration.

Table 1. Summary Statistics

Country	Mean	S.D.	J-B
US: Δcp_t	0.002	0.028	54.006 (0.000)
π_t	0.003	0.005	396.708 (0.000)
UK: Δcp_t	-0.002	0.029	69.140 (0.000)
π_t	0.005	0.006	1026.303 (0.000)
Japan: Δcp_t	0.002	0.028	507.01 (0.000)
π_t	0.002	0.006	60916.91 (0.000)

Note. S.D. denotes standard deviation and J-B is the Jarque-Bera test statistic for normality of the series and the numbers in parenthesis below the J-B statistics are probability values. Δcp_t is the monthly change in the (log) of the real commodity price index and π_t is monthly producer price inflation over the period 1960:1 to 2001:6 .

While mean commodity price returns are of similar magnitude for all three countries, the UK mean value is negative over the period while for the US and Japan this is positive. All the commodity price return series display similar variability. Over the period, average inflation is highest in the UK and least in Japan, with US inflation displaying least variability. All variables show significant departures from normality.

Table 2 below provides full sample and sub-sample simple correlation statistics between commodity prices and the corresponding inflation series for each of the countries in the sample period.

Table 2. Full Sample and Sub-Sample Correlations Between Real Commodity Price Returns and Inflation

Country	Correlations 1960:1 – 2001:6
US: Δcp_t , π_t	0.003
UK: Δcp_t , π_t	-0.137
Japan: Δcp_t , π_t	-0.0001
	Correlations 1960:1 – 1969:12
US: Δcp_t , π_t	-0.195
UK: Δcp_t , π_t	-0.161
Japan: Δcp_t , π_t	0.156
	Correlations 1970:1 – 1979:12
US: Δcp_t , π_t	0.046
UK: Δcp_t , π_t	-0.296
Japan: Δcp_t , π_t	-0.022
	Correlations 1980:1 – 1989:12
US: Δcp_t , π_t	-0.052
UK: Δcp_t , π_t	-0.092
Japan: Δcp_t , π_t	-0.144
	Correlations 1990:1 – 2001:6
US: Δcp_t , π_t	-0.084
UK: Δcp_t , π_t	-0.042
Japan: Δcp_t , π_t	-0.084

The US commodity return-inflation relationship changes sign, going from negative in the 1960s to positive in the 1970s and negative thereafter. In the Japanese case, the correlations also change sign but from positive in the 1960s to negative in the 1970s, 1980s and 1990s, while for the UK, the degree of association between the two variables is negative over both the full sample and sub-sample periods. The magnitude of the correlation statistics also change over time with the statistics indicating that the strongest degree of association is 1960s for the US and Japan but the 1970s for the UK. Such correlations can of course be influenced by changes in the deterministic component of commodity prices as well as those of supply and demand. Overall, these summary statistics provide some motivation for examining whether the types of shocks hitting the economy affect the commodity return-inflation relationship.

Before we embark on the main empirical results however, we first analyse the time series properties of the data. This is important not least as the model set out in the previous two sections requires that real commodity prices and the producer price index be I(1). The model is also specified on the assumption that, if commodity prices and producer prices are indeed I(1), they are not cointegrated. We therefore proceed to unit root and cointegration tests, which are reported in Tables 3a and 3b.

Table 3a. Unit Root Tests and Tests for Stationarity

Test	cp_t	p_t	Δcp_t	π_t
(i) ADF (4) Intercept, no trend				
US	-2.027	-0.843	-7.882	-6.043
UK	-0.996	-1.073	-7.729	-4.523
Japan	-1.377	-0.215	-4.158	-3.587
(ii) ADF (4) Intercept and trend				
US	-1.717	-0.359	-7.957	-6.084
UK	-2.300	-0.181	-7.768	-4.633
Japan	-1.981	-0.775	-8.367	-5.598

Note: ADF (4) denotes the Augmented Dickey-Fuller test at a lag length of 4. The 5% critical value for tests without a trend is –2.8751; for tests including a trend it is –3.4319.

For US, UK and Japan both (log) real commodity prices and (log) producer prices are clearly I(1), in the absence or presence of a trend term in the Dickey-Fuller equation.[1]

Before concluding that our model specification is correct, we test for cointegration between cp_t and p_t for each of the countries using the two-step Engle-Granger procedure.

Table 3b. Engle-Granger Cointegration Tests

	No trend	With trend
US	-1.592	-1.691
UK	-1.605	-1.686
Japan	-2.594	-2.678

Notes: the 5% critical value for the Engle-Granger test without trend is –3.3660 and for the case with a trend it is –3.8257.

It is clear from table 3b that the two variables are not cointegrated for any of the countries in the sample. The statistical nature of the variables therefore supports our specification of the VAR as one in the log first-differences of real commodity prices and producer price inflation. We now turn to the estimation and simulation of this model.

4. Empirical Results

Results of the standard tests of the optimal lag length (not reported) indicate that for the US 13 lags is optimal, for UK, this is 20 lags while for Japan the optimal lag length is 10. In all cases the optimal lag length is decided by considering the Akaike Information Criterion (AIC) and the Schwartz Information Criterion (SC). Having identified the supply and demand shocks by imposing the restrictions as described in the theoretical section above, we can now examine the variance decompositions of

[1] We also computed the ADF tests for lags up to 0, 1,2 and 3. The results are qualitively similar to those reported above in Table 3a.

commodity returns and inflation and the dynamic effects of each type of shock on commodity returns, inflation and on commodity prices themselves over various horizons.

Tables 4a through 4f below shows the variance decomposition of commodity price returns and inflation to supply and demand shocks for each of the countries in the sample.

Table 4a US Commodity Price Returns: Variance Decomposition

Period	S.E.	Supply Shock	Demand Shock
1	0.026704	82.15930	17.84070
2	0.027691	82.46891	17.53109
3	0.027867	82.58336	17.41664
4	0.027887	82.53817	17.46183
5	0.027962	82.13496	17.86504
6	0.028016	82.16175	17.83825
7	0.028127	82.29403	17.70597
8	0.028174	82.02097	17.97903
9	0.028203	82.05820	17.94180
10	0.028341	81.84065	18.15935
11	0.028550	81.93363	18.06637
12	0.028616	82.01585	17.98415
13	0.028709	82.07501	17.92499
14	0.028823	81.90056	18.09944
15	0.028839	81.85233	18.14767
16	0.028841	81.84580	18.15420
17	0.028843	81.84171	18.15829
18	0.028855	81.78962	18.21038
19	0.028867	81.72990	18.27010
20	0.028876	81.68238	18.31762

Table 4b. US Producer Price Inflation: Variance Decomposition

Period	S.E.	Supply Shock	Demand Shock
1	0.026704	15.36931	84.63069
2	0.027691	14.47084	85.52916
3	0.027867	14.75878	85.24122
4	0.027887	14.78185	85.21815
5	0.027962	15.73753	84.26247
6	0.028016	16.22981	83.77019
7	0.028127	15.83621	84.16379
8	0.028174	15.99454	84.00546
9	0.028203	16.82425	83.17575
10	0.028341	16.43749	83.56251
11	0.028550	16.45984	83.54016
12	0.028616	16.39999	83.60001
13	0.028709	15.74978	84.25022
14	0.028823	17.07513	82.92487
15	0.028839	18.11029	81.88971
16	0.028841	18.06121	81.93879
17	0.028843	18.10867	81.89133
18	0.028855	18.56530	81.43470
19	0.028867	18.35836	81.64164
20	0.028876	18.64097	81.35903

Table 4c. UK Commodity Price Returns: Variance Decomposition

Period	S.E.	Supply Shock	Demand Shock
1	0.026226	65.87837	34.12163
2	0.027111	66.51817	33.48183
3	0.027346	67.08660	32.91340
4	0.027494	67.30813	32.69187
5	0.027598	67.34165	32.65835
6	0.027768	66.58822	33.41178
7	0.027941	66.14953	33.85047
8	0.027948	66.11687	33.88313
9	0.028002	66.15009	33.84991
10	0.028289	66.77931	33.22069
11	0.028724	67.77749	32.22251
12	0.028830	67.67858	32.32142
13	0.028909	67.35286	32.64714
14	0.028946	67.42549	32.57451
15	0.028987	67.51733	32.48267
16	0.029022	67.59377	32.40623
17	0.029109	67.39153	32.60847
18	0.029144	67.44659	32.55341
19	0.029250	67.30518	32.69482
20	0.029872	64.95738	35.04262

Table 4d. UK Producer Price Inflation: Variance Decomposition

Period	S.E.	Supply Shock	Demand Shock
1	0.026226	45.15589	54.84411
2	0.027111	44.61597	55.38403
3	0.027346	43.84530	56.15470
4	0.027494	43.33701	56.66299
5	0.027598	41.56348	58.43652
6	0.027768	41.68729	58.31271
7	0.027941	42.21539	57.78461
8	0.027948	42.04857	57.95143
9	0.028002	41.68135	58.31865
10	0.028289	40.26754	59.73246
11	0.028724	40.12992	59.87008
12	0.028830	39.55480	60.44520
13	0.028909	38.77639	61.22361
14	0.028946	37.51713	62.48287
15	0.028987	37.42096	62.57904
16	0.029022	36.88802	63.11198
17	0.029109	37.03618	62.96382
18	0.029144	36.54612	63.45388
19	0.029250	36.33532	63.66468
20	0.029872	35.53520	64.46480

Table 4e. Japan Commodity Price Returns: Variance Decomposition

Period	S.E.	Supply Shock	Demand Shock
1	0.026747	93.15835	6.841654
2	0.027653	93.55626	6.443741
3	0.027827	93.62969	6.370314
4	0.027872	93.33515	6.664855
5	0.027921	93.02319	6.976809
6	0.027950	92.96197	7.038033
7	0.028047	93.00278	6.997220
8	0.028133	92.50593	7.494070
9	0.028155	92.51755	7.482451
10	0.028319	92.56122	7.438783
11	0.028471	92.60785	7.392154
12	0.028524	92.54790	7.452097
13	0.028533	92.49863	7.501370
14	0.028535	92.48833	7.511674
15	0.028537	92.48957	7.510427
16	0.028542	92.48156	7.518441
17	0.028550	92.42643	7.573572
18	0.028558	92.38930	7.610699
19	0.028562	92.36728	7.632723
20	0.028566	92.34315	7.656852

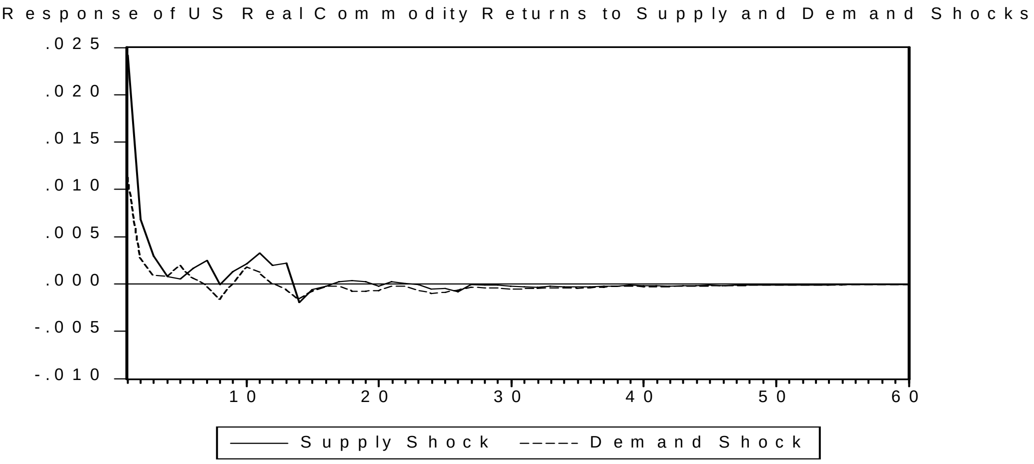
Table 4f. Japan Producer Price Inflation: Variance Decomposition

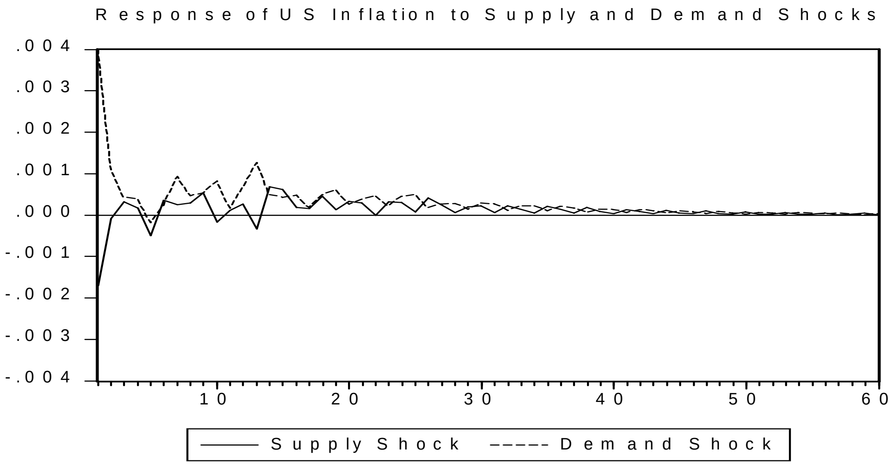
Period	S.E.	Supply Shock	Demand Shock
1	0.026747	8.434410	91.56559
2	0.027653	6.629560	93.37044
3	0.027827	6.138321	93.86168
4	0.027872	5.979224	94.02078
5	0.027921	5.762017	94.23798
6	0.027950	6.010964	93.98904
7	0.028047	6.791934	93.20807
8	0.028133	8.409982	91.59002
9	0.028155	9.257918	90.74208
10	0.028319	9.324702	90.67530
11	0.028471	10.48739	89.51261
12	0.028524	11.73445	88.26555
13	0.028533	12.49771	87.50229
14	0.028535	12.90215	87.09785
15	0.028537	13.21896	86.78104
16	0.028542	13.61600	86.38400
17	0.028550	14.19068	85.80932
18	0.028558	14.67937	85.32063
19	0.028562	14.92913	85.07087
20	0.028566	15.19979	84.80021

The above tables show that for the US, and even more so for Japan, the variance of commodity prices is dominated by supply shocks while the variance of inflation is dominated by demand shocks. While for the UK, a similar pattern emerges, for both commodity returns and inflation the proportion of variance accounted by demand shocks is relatively higher.

We now turn to the results for the response of real commodity returns, inflation and the level of real commodity prices to a one-standard deviation in supply and demand shocks. The results for the US, UK and Japan are shown in Figures 1 through 3 below.

Figure 1. US Impulse Response Functions





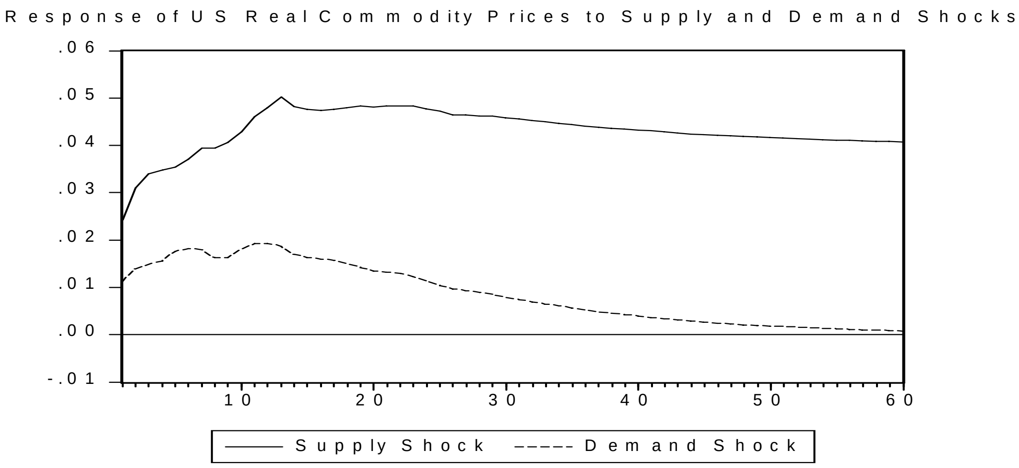


Figure 2. UK Impulse Response Functions

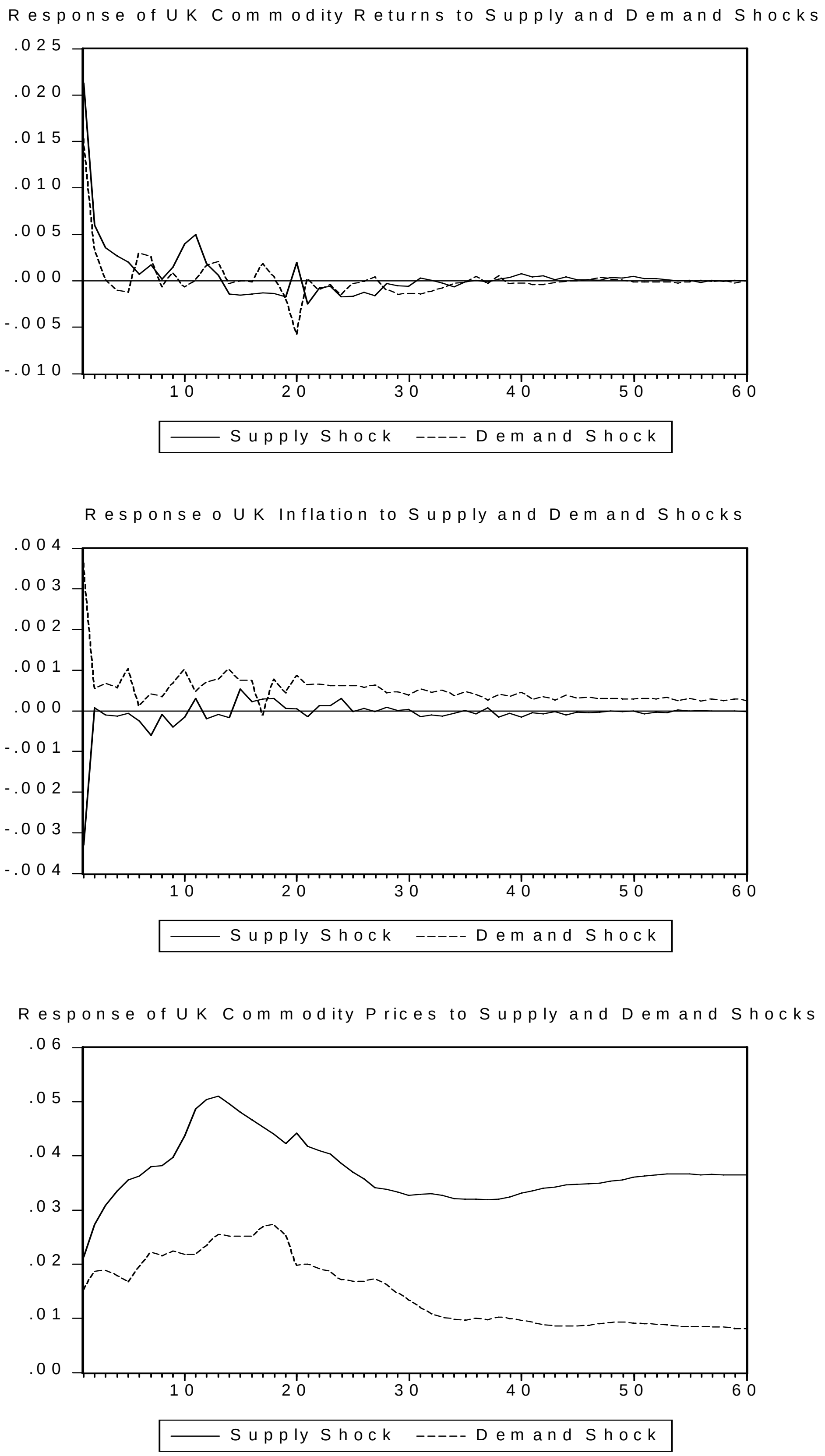
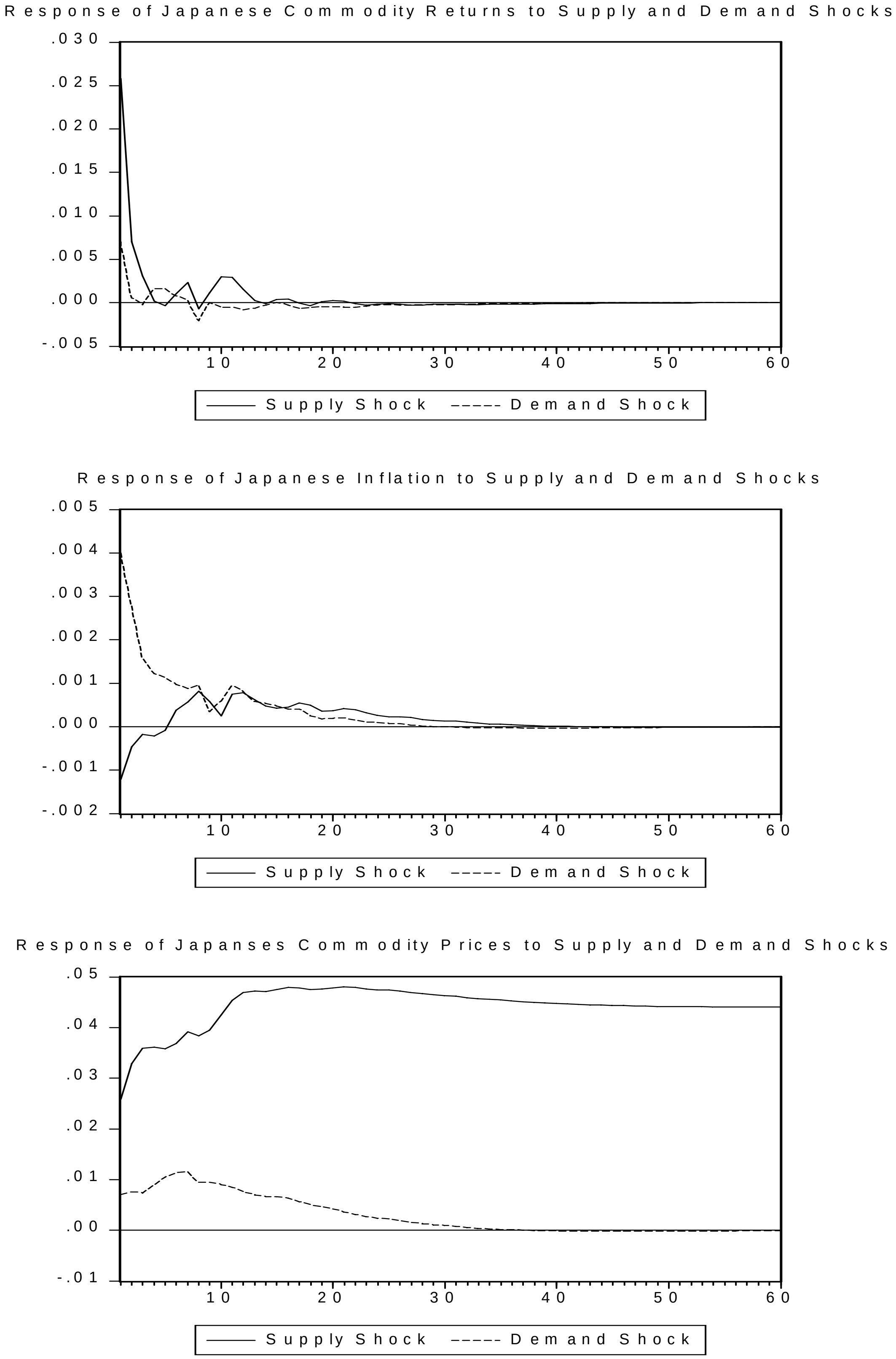


Figure 3. Japan Impulse Response Functions

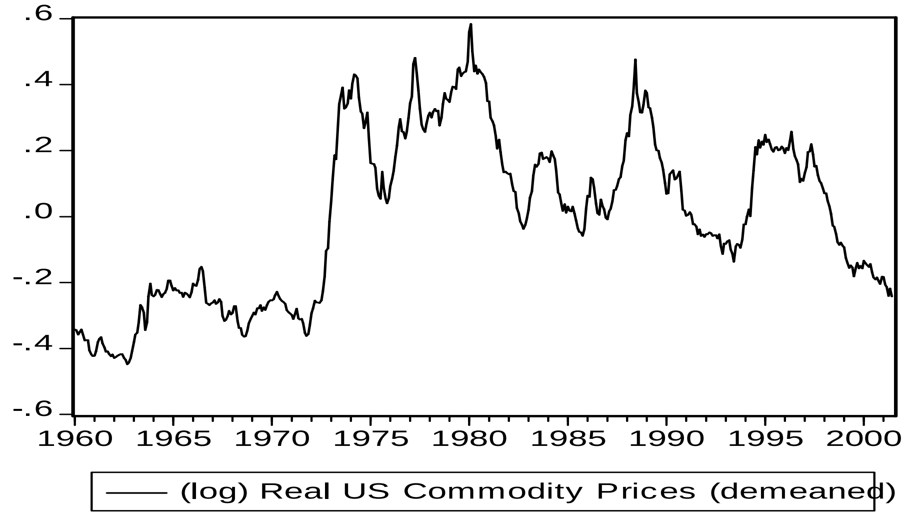


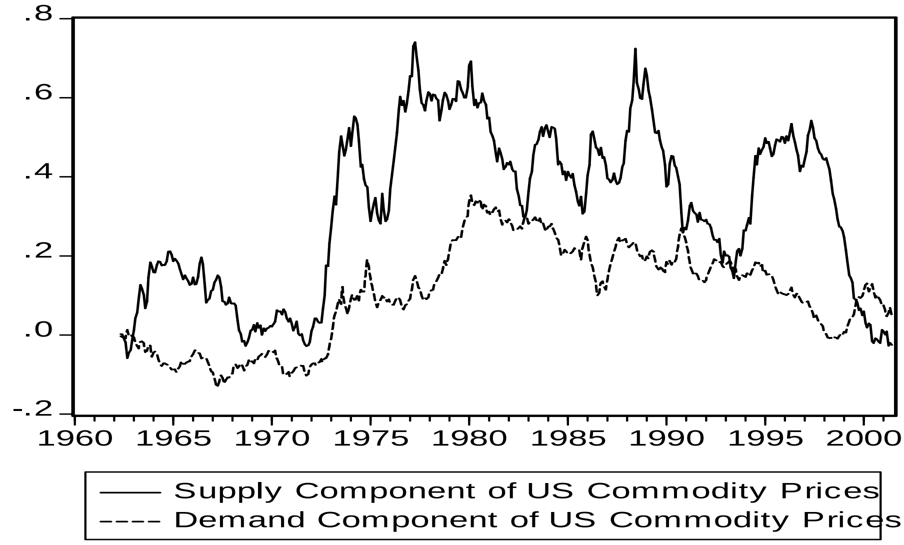
The US and Japan graphs show that while supply shocks tend to have a greater initial impact on commodity returns than demand shocks their impact is short lived with most of their effects disappearing after 4 months. Consistent with the theoretical model imposed, supply shocks have a negative contemporaneous effect on inflation, while demand shocks have a positive effect. The demand shock is relatively strong but the effect of both shocks also declines quite quickly. Our results in the first two graphs therefore support the view that supply shocks result in a negative relationship between commodity returns and inflation while demand shocks cause a positive relationship between commodity returns and inflation. The third panel of the graphs also indicate that, as expected, supply shocks have a permanent effect on commodity prices while demand shocks have a temporary effect.

While for the UK, supply shocks tend to have a greater initial impact on commodity returns than demand shocks, this difference is less noticeable than for the US and Japan. There is also relatively more volatility in the UK commodity price responses to supply and demand shocks. As with US and Japan, supply shocks have a permanent effect on commodity prices, and a demand shock a temporary effect. However, the UK stands out as being rather different in that it takes a relatively long time for the effects of the demand shocks to diminish: effects start to diminish at around 20 months but still have an impact at 60 months.

We can also decompose commodity prices into their supply and demand components. Following from the discussion of the SVAR in section 2 above, the estimated change in the demand component is $c_{12}(L)e^{d}_{t}$, which can then cumulated to get demand component of the commodity price series. The same procedure can be carried out to get the supply component. The deterministic component is then the sum of supply (permanent) and demand (temporary) subtracted from the cumulated real commodity return series. This decomposition is shown in Figures 4 through 6.

Figure 4. US Decomposition of Real Commodity Prices





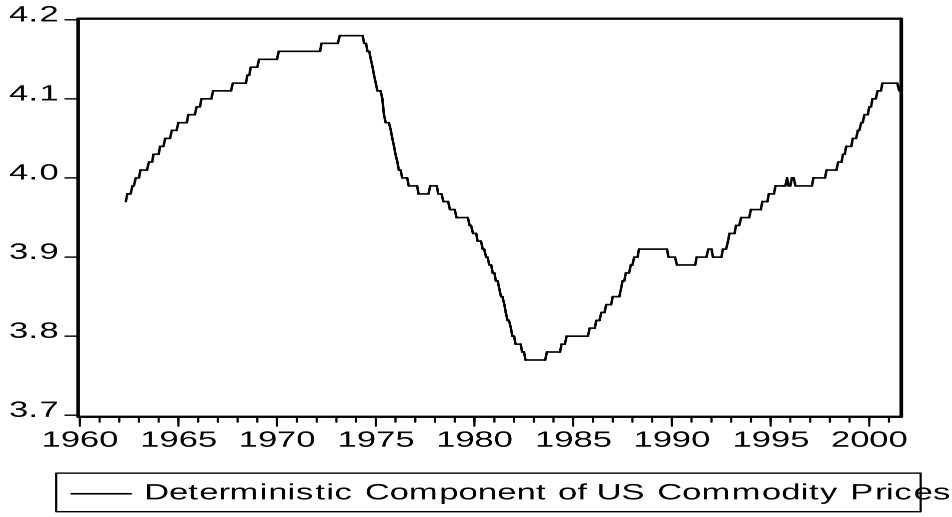


Figure 5. UK Decomposition of Real Commodity Prices

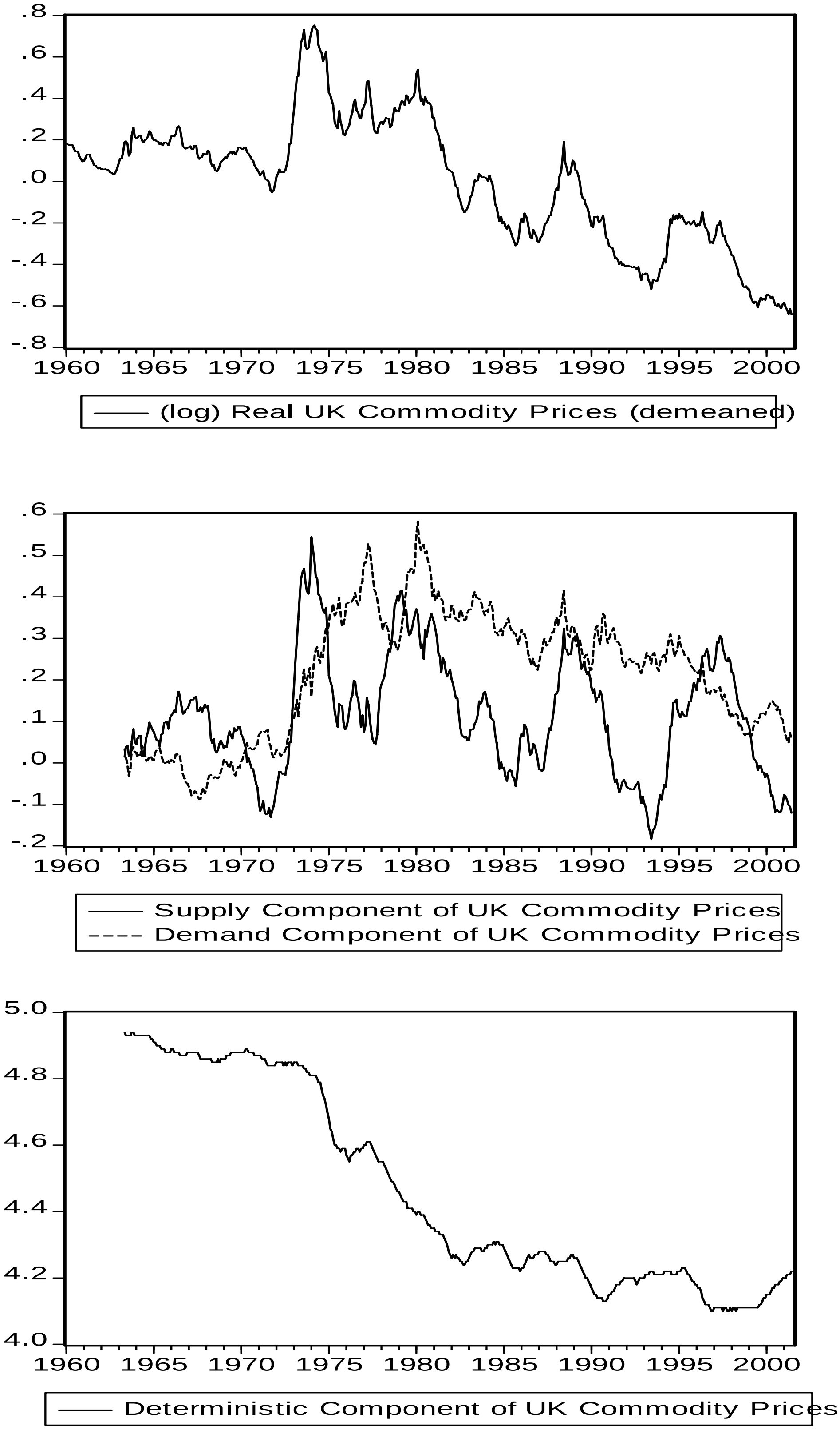
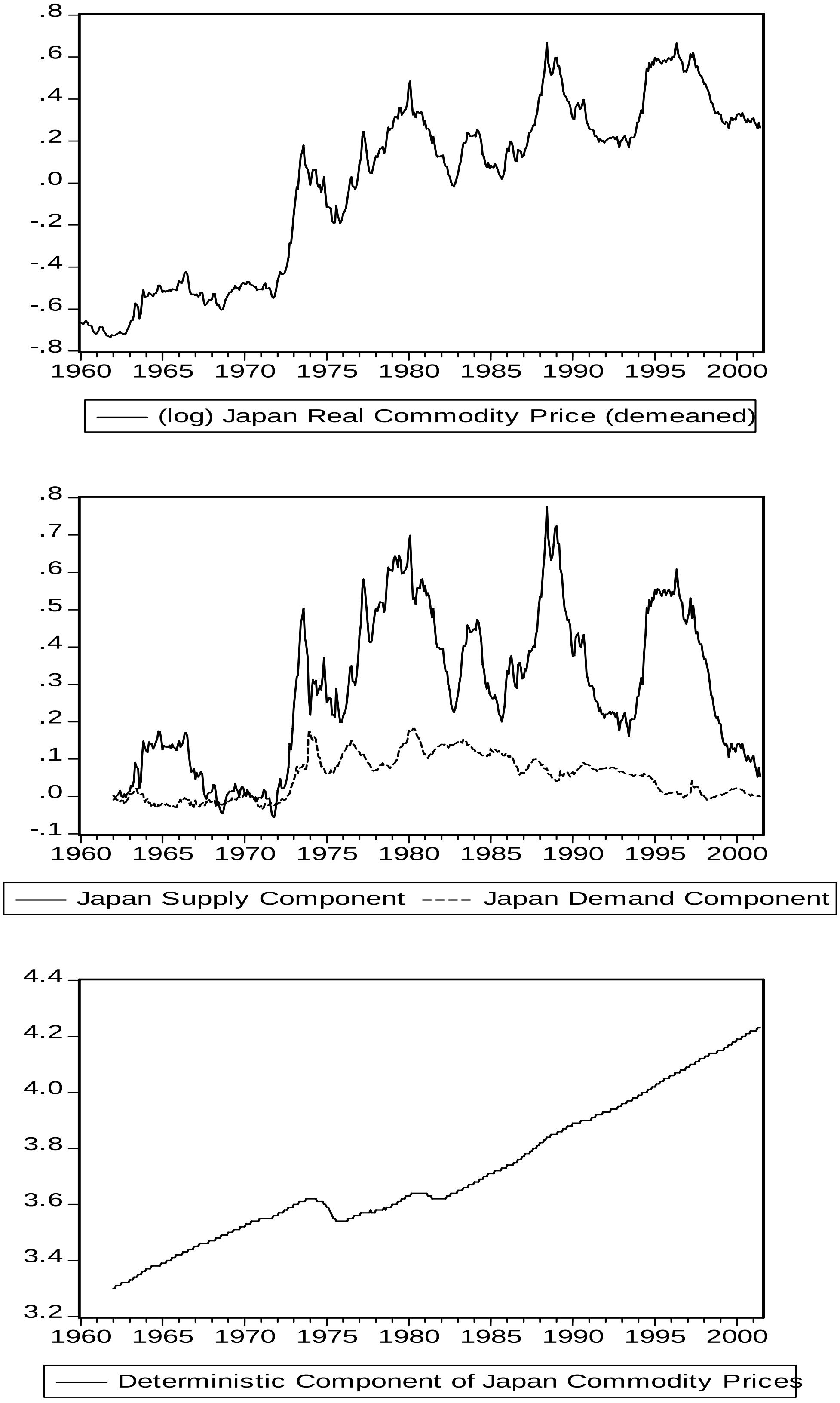


Figure 6. Japan Decomposition of Real Commodity Prices



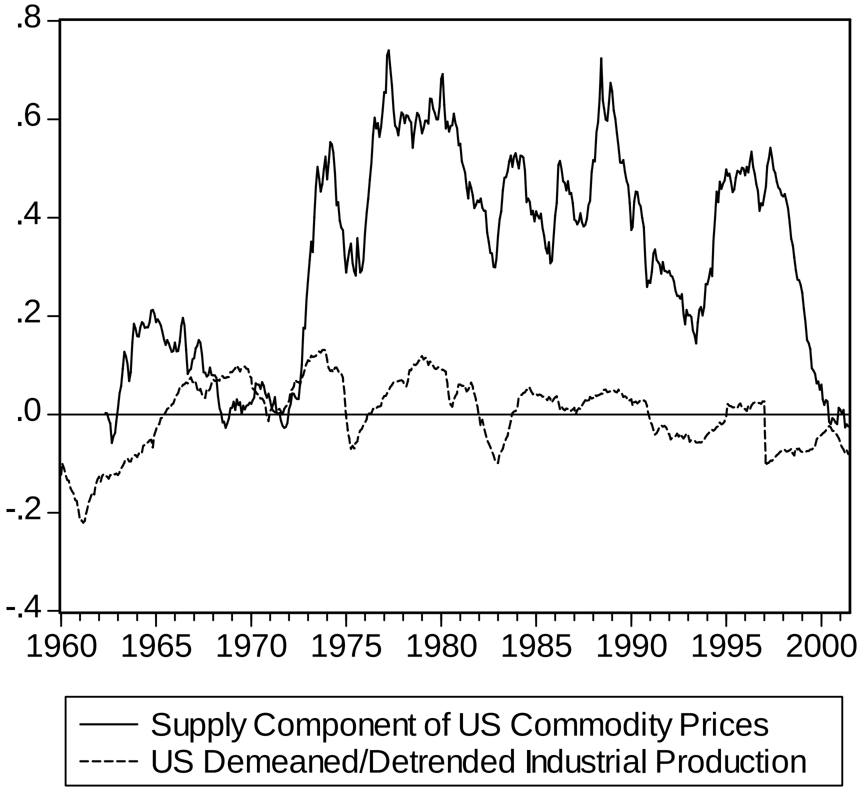
It is clear from the first two graphs of Figure 4 that supply influences have added considerably to real commodity price movements. It is interesting to note however that, subsequent to the first oil-price shock of the early 1970s, there was a sharp negative change in the supply component of commodity prices during 1974, and that the beginning of a slow decline in the supply component of prices dates from after the second oil-price shock of the late 1970s. In contrast the overall influence of demand on real commodity prices appears to have been relatively less important over the sample period. Exception to this pattern is the early 2000s when the demand component of commodity prices is greater then the supply component. Further, with the graph showing the demand component as negative over the period 1964 to 1973, the implication is that commodity prices over this period tended to be lower than they otherwise would have been in the absence of such shocks. Over the sample and in the absence of demand shocks (and excluding the deterministic component) commodity prices would have peaked in 1978 and 1989, while in the absence of supply shocks they would have peaked in 1981. The US deterministic component (mean value =3.991) displays quite dramatic swings in its influence on commodity prices with its influence peaking in the early 1970s and again at the end of the sample and having least influence in the early 1980s.

Figure 5 displays the decomposition for UK commodity prices and we can see that a quite different pattern emerges compared to the reported results using US data. While demand components keep real commodity prices lower than they would have otherwise been in the early part of the sample, in the mid 1970s, the early/mid 1980s, early/mid 1990s and from the late 1990s, the demand component increases quite dramatically: over these periods, demand influences appear to have a greater impact on commodity prices than supply influences. Interestingly, the deterministic component (mean value=4.458) of UK commodity prices has become less relatively less important over time although the downward movement has tended to moderate since the early 1980s. The strong downward influence of the deterministic component on commodity prices in the 1970s may account for the relatively strong negative correlation between commodity price returns and inflation for this time period reported in Table 2, even although demand influences are greater than those of supply over part of this period.

The Japanese commodity price decomposition is illustrated in Figure 6. Notably, the Japanese real commodity price pattern is more consistent with that of the US than with UK prices, albeit the series displays less variability than the US commodity price series. The Japanese price series also shows more of an upward trend in real prices than its US and UK counterparts, which may, in part at least, be due to the deterministic component: with only two relatively minor blips in the early 1970s and 1980s, the Japanese deterministic component (mean value=3.71) has been on a upward trajectory over the sample period. It is also noticeable that the Japanese demand component is far less variable that the supply component, the latter following a similar time path to the supply component of the US and UK.

Figures 7, 8 and 9 below show the above decomposition of supply and demand shocks and compare these to movements in some macroeconomic variables that can be considered to be relevant to the processing of information by commodity markets.

Figure 7. US Decomposition and Macro Variables



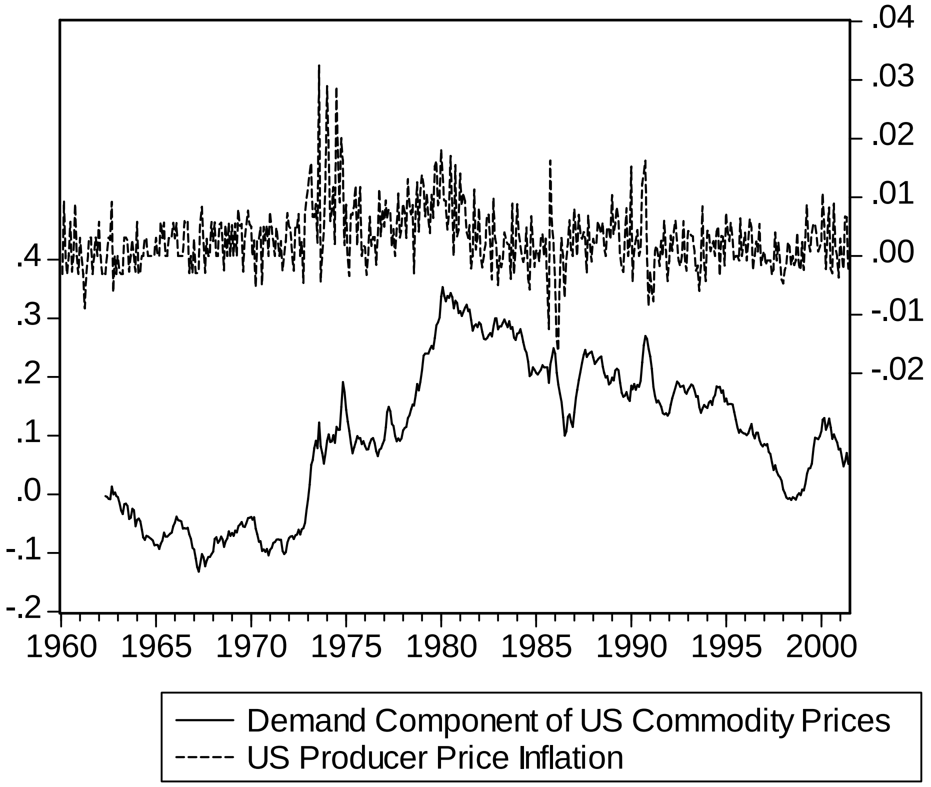
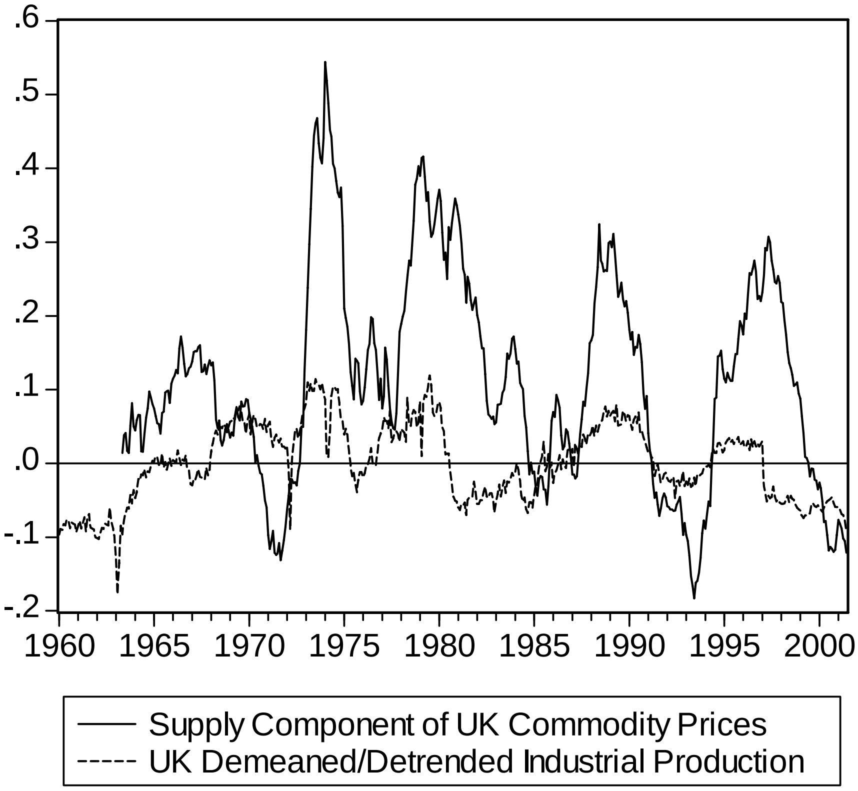


Figure 8. UK Decomposition and Macro Variables



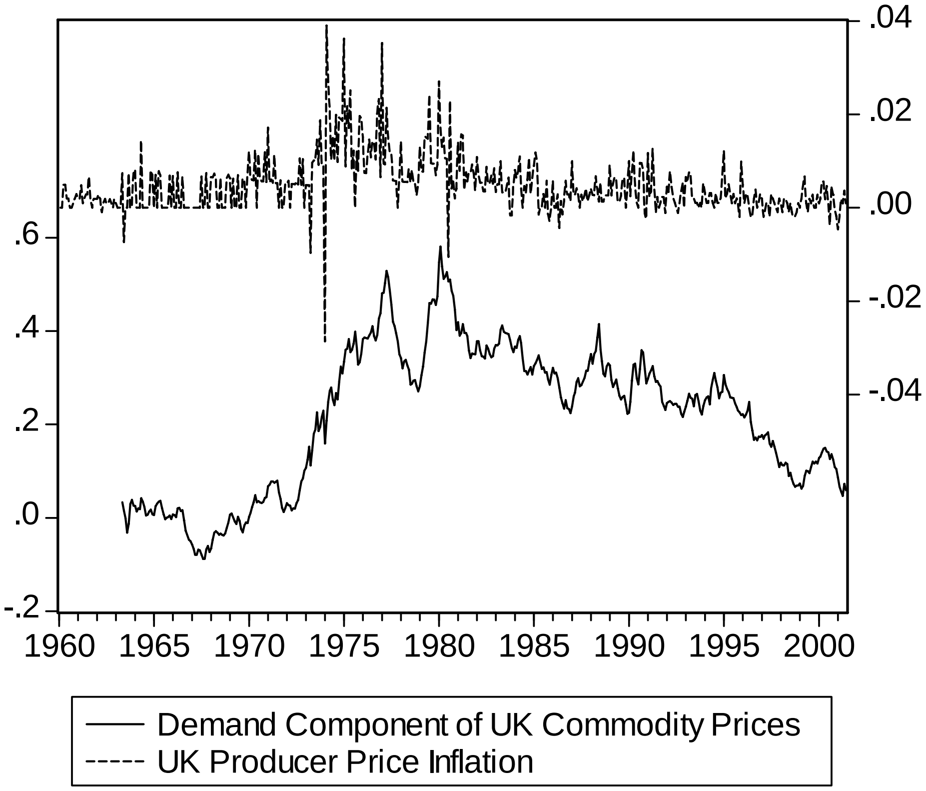


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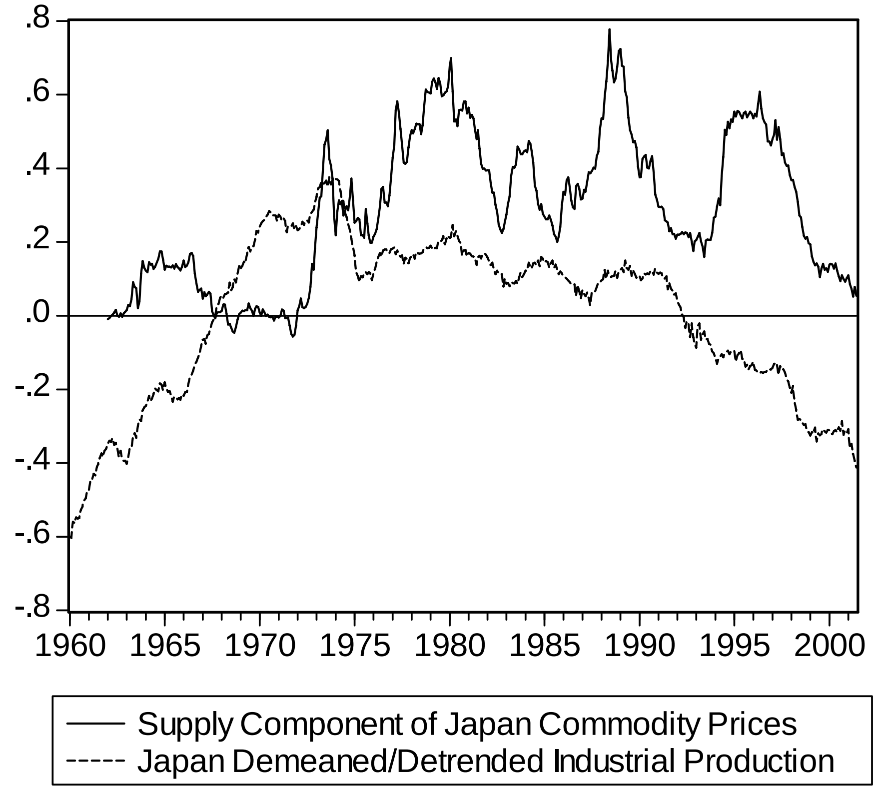
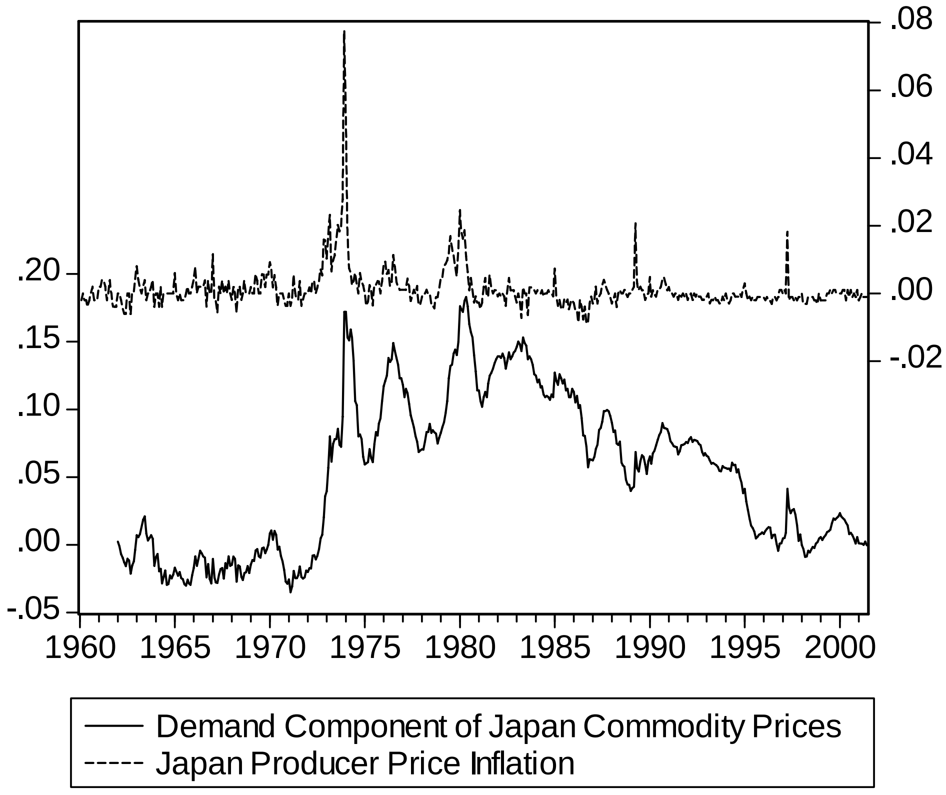
Figure 9. Japan Decomposition and Macro Variables





For all three countries there appears to be an association between the supply component of commodity prices and (detrended and demeaned) real industrial production – hence an, albeit crude, industrial business cycle index. What is particularly interesting is that the supply component of commodity prices goes up when industrial production is above its trend (in this case zero) and goes down when it is below trend: Deviations from trend may therefore be a relevant factor in agents' information set thus help drive the supply component of commodity prices.

For comparison, we also show the demand (transitory) components of commodity prices alongside the appropriate producer price inflation series. While the volatility of the inflation series tends to obscure associations between the two variables, inspection of the graphs suggests that periods of relatively high inflation are associated with relatively high values and volatility of the demand components.

5. Conclusions

The purpose of this paper is to assess the impact of economy-wide supply and demand shocks on commodity prices in three of the world's major economies. Utilising a small theoretical macro model, the reported empirical results support the hypothesis that the relationship between real commodity prices and inflation can be either positive or negative depending on the relative importance of supply (real output) and demand (monetary) shocks in the national economy. Our results also show that differences occur across economies, with the UK commodity returns registering more sensitivity to demand shocks than those set in US and Japanese markets.

We investigate these issues further by decomposing real commodity prices in order to consider supply and demand influences at different periods in time. As the same model generates all the shocks, the decomposition of the variables reflects the differing importance of the shocks over time and provides information on the changing characteristics of real commodity price fluctuations. Our observations suggest that for the US and Japan, supply influences have tended to dominate commodity price movements and, for Japan in particular, the supply component has clearly prevailed since the early 1970s. Conversely, for the UK, the effect of supply fluctuations has waned since the late 1970s, with a relatively high proportion of the variability of commodity prices since then being due to demand effects. Differences in commodity price responses to supply and demand shocks across economies suggest that commodity markets are not fully integrated but are highly sensitive to national influences.

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